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ENVIRONMENTAL ASSESSMENT BOARD



Ontario

ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

VOLUME: 124

DATE: Monday, March 30, 1992


BEFORE:

HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

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ENVIRONMENTAL ASSESSMENT BOARD
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act,
R.S.O. 1980, c. 140, as amended, and Regulations
thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro
consisting of a program in respect of activities
associated with meeting future electricity
requirements in Ontario.

Held on the 5th Floor, 2200
Yonge Street, Toronto, Ontario,
on Monday, the 30th day of March,
1992, commencing at 10:00 a.m.

VOLUME 124

B E F O R E :

THE HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

S T A F F :

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MR. R. NUNN	Counsel/Manager, Information Systems
MS. C. MARTIN	Administrative Coordinator
MS. G. MORRISON	Executive Coordinator

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G. A. KARISH)	
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M. IZZARD)	ASSOCIATION, INTERNATIONAL
		INSTITUTE OF CONCERN FOR
		PUBLIC HEALTH
G. GRENVILLE-WOOD		SESCI

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I N D E X o f P R O C E E D I N G S

Page No.

<u>DAVID WHILLANS,</u>	
<u>KURT JOHANSEN,</u>	
<u>FRANK CALVIN KING,</u>	
<u>WILLIAM JOHN PENN,</u>	
<u>IAN NICHOL DALY; Resumed.</u>	21594

Cross-Examination by Mr. Heintzman (Cont'd)	21594
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L I S T o f E X H I B I T S

No.	Description	Page No.
520.30	Interrogatory No. 9.2.73.	21640
537	One page bearing two graphs from Exhibit 519, being parts of two graphs from Exhibit 519.	21658
538	Competing in the New Global Economy, Report of the Premier's Council Industry Studies, Volume 2.	21672
539	Letter to K.R. Hedges from J. McCredie dated March 20, 1992 with attachment.	21688
520.31	Tab 9 of Interrogatory 9.7.160.	21689
520.32	Interrogatory No. 9.24.4.	21700
540	Document entitled April 1991, Nuclear Station Operating Costs, Ontario Hydro and the U.S. Nuclear Industry, 1988-1989.	21701
520.33	Interrogatory No. 9.2.113.	21725
520.34	Interrogatory No. 9.2.115.	21725
541	Proceedings of the Sixth KAIFKNS Annual Conference, April 15th to 17th, 1991, Seoul, Korea, a paper entitled Candu Retubing: A Review of Ontario Hydro's Current Experience and Future Improvements, by J.O.N. Allen.	21739
542	Letter to Mr. Lockerby, dated March 19th, 1992.	21743
520.35	Interrogatory No. 9.9.15.	21746
543	Document entitled Load Following in CANDU PHWR, by H. Keil and A. Lopez.	21765

L I S T o f E X H I B I T S
(Cont'd)

<u>No.</u>	<u>Description</u>	<u>Page No.</u>
544	Remarks of Mr. Lopez and others From Ontario Hydro to the Canadian Nuclear Society, ninth annual conference in 1988, June 13th to 15th, 1988, Winnipeg, Manitoba.	21771
545	Article, published CIGRE, in 1987, "Cycling of Nuclear Power Plants to Meet Grid Operational Requirements".	21775
520.36	Interrogatory No. 9.2.45.	21778

TIME NOTATIONSPage No.

	10:01 a.m.	-----	21593
	10:12 a.m.	-----	21600
	10:24 a.m.	-----	21608
	10:40 a.m.	-----	21618
	10:55 a.m.	-----	21629
	11:15 a.m.	-----	21642
Recess	11:30 a.m.	-----	21656
Resume	11:56 a.m.	-----	21656
	12:15 p.m.	-----	21669
	12:37 p.m.	-----	21682
	12:53 p.m.	-----	21695
Luncheon recess	1:05 p.m.	-----	21700
Resume	2:33 p.m.	-----	21700
	2:49 p.m.	-----	21709
	3:05 p.m.	-----	21724
	3:28 p.m.	-----	21737
Recess	3:29 p.m.	-----	21548
Resume	3:47 p.m.	-----	21548
	4:07 p.m.	-----	21749
	4:26 p.m.	-----	21764
	4:45 p.m.	-----	21778
Adjourned	5:00 p.m.	-----	21786

1 ---Upon commencing at 10:01 a.m.

2 THE REGISTRAR: Please come to order.
3 This hearing is now in session. Be seated, please.

4 THE CHAIRMAN: Ms. Harvie?

5 MS. HARVIE: Mr. Chairman, we have two
6 undertakings to file. I have given eight copies of
7 each of 932.1 and .2 to Mr. Lucas and given a copy to
8 counsel for AECL, and there are a few additional copies
9 on the side table here.

10 THE CHAIRMAN: Thank you. Are there some
11 exhibits that have been filed? Do you want to refer to
12 those?

13 MS. HARVIE: I'm sorry, I am not sure to
14 which you are referring.

15 THE CHAIRMAN: 452C and D and 535 and
16 536?

17 MS. HARVIE: I wasn't aware they had been
18 filed.

19 THE REGISTRAR: 535 and 536 have
20 certainly been reserved.

21 MS. HARVIE: Oh, yes. Those have not yet
22 been filed, but they will be tomorrow or Wednesday.

23 THE CHAIRMAN: All right. Thank you.
24 Mr. Heintzman?
25

1 DAVID WHILLANS,
2 KURT JOHANSEN,
3 FRANK CALVIN KING,
 WILLIAM JOHN PENN,
 IAN NICHOL DALY; Resumed.

4 CROSS-EXAMINATION BY MR. HEINTZMAN (Cont'd):

5 Q. Mr. Penn, when we adjourned we were
6 discussing, you and I, the DSP, and on reviewing the
7 transcript I think that you and I had agreed on a
8 couple of points and we were at our fourth point. The
9 first thing that we had agreed on was that the DSP
10 selected Plan 15 or Case 15 as the preferred case.

11 MR. PENN: A. That's correct.

12 Q. Yes. And that Case 15 had nuclear
13 generation for the base load component of that case?

14 A. That's correct.

15 Q. And we had agreed that the choice of
16 nuclear for base load was based on a number of factors,
17 and you and I reviewed the one of cost and had agreed
18 that at the time of the DSP nuclear was the least cost
19 alternative and while the margin has diminished
20 somewhat it still remains the least cost alternative?

21 A. That's correct, for future
22 generation, yes.

23 Q. Yes. And I was just suggesting to
24 you a second reason why Case 15 had been selected --
25 sorry, why Case 15 had selected nuclear load for the

1 base load, and that was environmental reasons, and I
2 would just like to take you to a few of the pages of
3 Exhibit 3 on that point, if I could.

4 Do you have Exhibit 3 in front of you?

5 A. Yes, I do.

6 Q. And perhaps we can start with the
7 introduction, which has Roman numerals, just to pick up
8 some of the discussion.

9 At Roman numeral XIII we are given an
10 overview in paragraph 26, and it says:

11 The preferred choice, the proposed
12 plan, features the high priority options
13 and uses CANDU nuclear generation to meet
14 additional base load requirements,
15 gas-fueled combustion turbine units to
16 meet peak load requirements, and existing
17 fossil generation, et cetera, to meet
18 intermediate load requirements.

19
20 So we see there the reference to nuclear generation to
21 meet the additional base load requirements.

22 And if we could turn over to pages 15-7
23 and -8 we can see the various cases, particularly case
24 26, Case 15 and case 23 set out in graphic form, and
25 under Case 15 for base load it says, "Base load:

1 nuclear".

2 And if we then --

3 A. In Case 15 it says, "Base load:
4 nuclear". Right.

5 Q. If we turn to the next page, page
6 15-8, describing Case 15 in the bottom left-hand corner
7 the DSP says:

8 This case is designed to achieve both
9 low air emissions and low cost. A
10 mixture of base load nuclear and peaking
11 fossil options is used to achieve low
12 acid gas and greenhouse emissions, low
13 cost flexibility and capacity diversity.
14 Intermediate load is met by existing
15 fossil stations retrofitted as required
16 with emission controls.

17 A. That is what it says.

18 Q. Yes. And just to complete the
19 references on these two pages, you will see in the
20 third column under Case 15 it says:

21 In this case about two-thirds of the
22 new capacity under each load forecast
23 condition consists of purchases and base
24 load nuclear generation.

25 A. Excuse me. Where are you reading

1 from?

2 Q. The third column of page 15-8 under
3 the heading "Description of Major Supply Cases, Case
4 15".

5 A. I have it, yes.

6 Q. And it says:

7 In this case about two-thirds of the
8 new capacity under each load forecast
9 condition consists of purchases and base
10 load nuclear generation. The remaining
11 one third is peaking fossil generation.
12 figure 15-8 summarizes the capacity
13 additions.

14 And similarly, on the next page in the
15 first paragraph under the "Median Load Forecast":

16 Base load requirement is supplied by
17 nuclear generation, et cetera.

18 A. Yes.

19 Q. So that if you turn with me to the
20 approvals on page 19-2 we there see the nuclear
21 generation program that is spoken of in what we have
22 just read as being the base load element of the new
23 program?

24 A. That was the case at the time this
25 document was written, yes.

1 Q. Yes. So if we go back to page

2 15-8 --

3 MR. B. CAMPBELL: Just a moment, Mr.
4 Chairman.

5 I don't think it is fair to say that what
6 is shown on 19-2 is entirely nuclear in its base load
7 element. I believe that there is integrated
8 gasification, integrated coal gasification spoken of
9 there as well, which has the potential to play the base
10 load role.

11 My friend is, I think, making an
12 assumption and getting a little ahead of himself into
13 Panel 10 matters which this Panel cannot deal with, but
14 I think it is clear that certainly if he would accept a
15 slight modification that certainly the nuclear that is
16 there is at least a major part of the additional base
17 load considerations I think I would accept that as a
18 fair characterization.

19 MR. HEINTZMAN: I am anxious to get the
20 answers of the witnesses, not the answers of Mr.
21 Campbell.

22 Q. As I understand the Plan or Plan 15,
23 the IGCC is intended for intermediate load requirements
24 and that --

25 MR. B. CAMPBELL: Well --

1 THE CHAIRMAN: I think you made your
2 point, Mr. Campbell. But if this witness can answer
3 the question he can, and if he can't answer the
4 question, if it is a planning answer, then he doesn't
5 need to answer it.

6 MR. HEINTZMAN: Q. Is that not the case,
7 that the base load requirement for this plan is
8 provided virtually entirely by the nuclear generating
9 stations and that the other program that we see on Plan
10 15, 19-2, is for peaking and intermediate load? That
11 is the basis upon which this plan was developed?

12 MR. PENN: A. Well, as I explained to
13 you last Thursday, I only have general knowledge of
14 this plan because I was not party to writing this
15 document. From my background understanding, your
16 comments are largely correct.

17 Q. Thank you. Now, let's go back, then,
18 to page 15-8, the bottom left-hand corner:

19 This case is designed, Case 15, to
20 achieve both low air emissions and low
21 cost. A mixture of base load nuclear and
22 peaking fossil options is used to achieve
23 low acid gas and greenhouse emissions.

24 So one of the reasons for selecting Case
25 15 and for Case 15 selecting nuclear generation was the

1 environmental issue there spoken of; that is,
2 elimination or lowering of acid gas and greenhouse
3 emissions?

4 A. Well, again, I repeat that I am not
5 in System Planning Division and I am not particularly
6 familiar with this. It is my understanding, glancing
7 at this document, that what we have here is a summary
8 of the five cases and what they contain and what their
9 advantages and disadvantages are.

10 Q. Yes. And one of the advantages of
11 Case 15 and one of the advantages of Case 15 base load
12 being nuclear is that it has that result, and that was
13 one of the reasons that Case 15 was selected and Case
14 15 selected nuclear as base load generation.

15 Doesn't that follow from what we are
16 reading in the DSP?

17 [10:12 a.m.]

18 A. Well, it may follow, but I can only
19 repeat again that I think this is -- I am not quite
20 sure the purpose of your cross-examination here, but
21 this is a matter that Panel 10 are expert in. There
22 are three system planners on that panel to talk to this
23 type of issue.

24 Q. We will be discussing system planning
25 issues at that time, but what I am trying to get at now

1 is the essential nature of nuclear generation and have
2 this panel speak to that issue. And certainly you
3 would agree with me, would you not, that one of the
4 essential - and anybody on the panel, Dr. Whillans or
5 Mr. Johansen, I don't want to preclude you from this
6 discussion - but as I understood your evidence in
7 chief, one of the reasons for selecting nuclear
8 generation is for the very reason set forth on page
9 15-8; namely, that it has the result of achieving low
10 acid gas and greenhouse emissions; is that not the
11 case?

12 A. Well, I don't recall my evidence in
13 chief discussing that particular characteristic, but it
14 follows that of course nuclear generation does not emit
15 greenhouse emissions as a fundamental property.

16 Q. Does anybody on the panel have any
17 problem with that being one of the basic reasons that
18 the DSP selected Plan 15?

19 If you turn with me to page 17-15 and
20 17-17, which is the choice pages that tell us the
21 choice that is made by Ontario Hydro. Starting at the
22 bottom right-hand corner of page 17-15, on the issues
23 that we are discussing.

24 MR. B. CAMPBELL: Mr. Chairman, the
25 witnesses have already pointed out, we have three

1 planners on Panel 10 who are dealing with the choices,
2 rationale, the trade-offs, the relative advantages and
3 disadvantages. Those are the witnesses to do it.

4 My friend started his question by saying,
5 using words that this panel could deal with, the
6 essential characteristics of nuclear, and that is
7 correct, and if he limits his question to that I have
8 no objection to that. But as soon as he moves into
9 this area of the document when he is talking about
10 whether essentially and at their heart and core pure
11 planning matters, this is the wrong panel. These
12 witnesses are not qualified in those areas.

13 MR. HEINTZMAN: With respect, Mr.
14 Chairman, so far you have ruled three times both in
15 previous panels and in this panel that I can ask these
16 questions and I would ask that I be permitted to ask
17 them.

18 THE CHAIRMAN: You can ask them but you
19 have got to ask to accept the answers that they don't
20 know.

21 They do know that about the emission
22 characteristics or absence of characteristics of
23 nuclear, they know about that and they have answered
24 that. But if they don't know about why this particular
25 balance was used or why they used so much of this or so

1 much of that. I think you have to accept that. So I
2 don't think there is any point in pursuing it.

3 MR. HEINTZMAN: I would like to get the
4 understanding of the panel, of this panel, so that we
5 can then move on to the next panel.

6 Q. But does anybody in this panel have
7 any problem with the proposition that nuclear
8 generation was selected by the DSP because of the
9 matters set forth on page 17-17; namely, that it
10 results in a reduction in acid gas emissions and CO(2)
11 emissions and that that was one of the reasons for its
12 selection?

13 THE CHAIRMAN: The answer to that is yes,
14 that is the characteristic of nuclear generation and
15 that's that. That's a characteristic. What you do
16 with that characteristic in your planning is something
17 for Panel 10.

18 MR. HEINTZMAN: Fine.

19 Q. Does anybody have a problem with the
20 proposition that nothing has changed on that score with
21 respect to nuclear generation for base load, and indeed
22 I suppose for any load, having that characteristic and
23 that result as much today, if not more, than it had at
24 the time that the DSP was prepared?

25 MR. B. CAMPBELL: Could you explain what

1 you mean by if not more?

2 If you are going to ask the witnesses and
3 say it has more of a certain characteristic, perhaps
4 you could just explain what you are meaning by that.
5 It emitted no CO(2), is it emitting less than no CO(2)
6 now?

7 MR. HEINTZMAN: I am very grateful to Mr.
8 Campbell for helping us along here.

9 Q. What I am saying is, it has that
10 characteristic today to the same extent that it had in
11 1989 when the DSP was prepared; am I correct on that,
12 Mr. Penn?

13 MR. PENN: A. If you are talking about
14 the fact that nuclear energy does not emit carbon
15 dioxide, you are quite right. But I don't know what
16 other characteristic you are referring to.

17 Q. And acid gas and all of the other
18 problems referred to on page 17-17, acid gas emissions
19 and CO(2) emissions. That is a reason today for
20 selecting nuclear over fossil generation as it was in
21 1989; correct?

22 MR. B. CAMPBELL: Just a minute. Are you
23 speaking of all of the matters on 17-17, or are you
24 speaking only of the two specific ones you mentioned?
25 Your question included reference to both. If you are

1 speaking simply to acid gas and CO(2), that's one
2 question. If you are speaking to all of the other
3 matters, then I make the same objection, Mr. Chairman,
4 about Panel 10.

5 MR. HEINTZMAN: Q. Let's start with
6 those two. Today the reason for selecting nuclear is
7 as much based upon those two criteria as it was in
8 1989. Do you have any problem with that?

9 MR. PENN: A. Well, as I mentioned,
10 nuclear power does not emit either acid emissions or
11 carbon dioxide. And in the discussion on 17-17, with
12 regard to acid gas emissions, it says Plan 22 has the
13 lowest acid gas emissions, because that one, if my
14 memory serves me correctly, contains the highest
15 nuclear generation. Plan 15 has the next lowest and
16 Plan 24 has the highest because that didn't contain any
17 nuclear, if my memory serves me correctly.

18 Q. And the one that has the lowest uses
19 nuclear for other than base load, it uses it
20 predominantly for intermediate and other types of load;
21 is that not correct, with a resultant higher cost?

22 A. It's been a while since I have read
23 this document, Mr. Heintzman, quite a while. From my
24 memory -- I'm sorry, I have lost track of the question.

25 THE CHAIRMAN: Surely these are Panel 10

1 type questions. Technically you are right, you can ask
2 them but they can't help you very much.

3 MR. HEINTZMAN: With respect, Mr.
4 Chairman, this is the panel that is here to discuss
5 nuclear.

6 THE CHAIRMAN: They are here to discuss
7 the characteristics of nuclear generation. Panel 10
8 discusses how nuclear fits into the planning, as I
9 understand it, it is a broad distinction.

10 MR. HEINTZMAN: Yes, but the planners can
11 only deal with the characteristics as they are
12 acknowledged to be, and I would like to advance to that
13 point on that footing.

14 THE CHAIRMAN: He has said, I think he
15 said, that there are no significant CO(2) or acid gas
16 emissions in nuclear generation and that nuclear
17 remains low cost as compared to fossil, although the
18 gap between the two has narrowed since the DSP. That's
19 the summary of his evidence.

20 MR. HEINTZMAN: Q. Perhaps I can just
21 ask Dr. Whillans and Mr. Johansen. You are involved
22 more in the issues of the environment and you are
23 familiar, I assume, with the matters of acid gas
24 emissions and CO(2) emissions, and indeed with
25 radioactive concerns at the bottom of page 17-17.

1 Those are matters falling within your province and
2 expertise; is that correct?

3 MR. JOHANSEN: A. That's right.

4 Q. And with respect to those criteria,
5 would it be fair to say that the characteristics of
6 nuclear which led to this choice in 1989 remain the
7 same today and would give rise to the same choice
8 today?

9 THE CHAIRMAN: That is a different
10 question.

11 MR. JOHANSEN: The characteristics
12 remain --

13 THE CHAIRMAN: Hold it, please.
14 I don't think you should ask them that
15 question.

16 MR. HEINTZMAN: Why not, Mr. Chairman?

17 THE CHAIRMAN: You can ask the first
18 part. The first part is fine, but the second part
19 deals with choices and I don't think you should be
20 asking those questions.

21 MR. HEINTZMAN: I want this panel's --

22 THE CHAIRMAN: Because they have told you
23 they don't know the answer.

24 MR. HEINTZMAN: No, they have not, with
25 respect.

1 MR. B. CAMPBELL: Yes, they have. I have
2 heard it several times this morning. And besides, I
3 would point out that there is no one on this panel who
4 is qualified as an expert to give opinion evidence on
5 planning matters. They are here to tell you about the
6 characteristics of a particular option. That is what
7 they are here for.

8 THE CHAIRMAN: I don't think it's going
9 to help us very much in making a decision about Hydro's
10 planning as to what these witnesses think the choices
11 ought to be. We are looking to Panel 10 for that.

12 MR. HEINTZMAN: Well, Mr. Chairman, with
13 respect, Mr. Johansen, when we looked at his CV, is
14 eminently qualified to speak on these matters. This is
15 his very...

16 THE CHAIRMAN: I don't take any objection
17 to the first part of your question that you asked Mr.
18 Johansen and Dr. Whillans. I didn't take any objection
19 to that. It's the second part that I think is the
20 difficult one.

21 MR. HEINTZMAN: Well, Mr. Johansen, can
22 we look at his qualifications, Mr. Chairman?

23 [10:24 a.m.]

24 THE CHAIRMAN: Rather than take the time
25 doing that why don't you ask him the question but bear

1 in mind what we are talking about, that this is not
2 Panel 10, this is Panel 9.

3 MR. HEINTZMAN: Yes.

4 Q. Mr. Johansen, I am looking at your
5 curriculum vitae, and it says that you have prepared or
6 supervised environmental assessments of nuclear,
7 fossil, hydroelectric and energy from waste concepts or
8 projects; you have had extensive involvement in the
9 assessment of radioactive materials management plans
10 and concepts, including the used fuel disposal concept
11 being developed by AECL in the Canadian Nuclear Fuel
12 Waste Management Program.

13 MR. JOHANSEN: A. That is correct.

14 Q. That is your background and your
15 qualifications?

16 A. That is correct.

17 Q. And you have had to deal with the
18 sort of matters that are set forth on page 17-17 for
19 many years; correct?

20 A. Over a number of years and on a
21 project-by-project basis. It has never been my
22 obligation to make choices between those energy forms.

23 Q. But --

24 A. It is one thing to characterize them
25 or evaluate them or assess them. It is another to make

1 choices.

2 Q. No, but any time you give
3 consideration to whether this thing should occur or
4 whether this project should go forward, from an
5 emissions standpoint you are necessarily saying, well,
6 there is a better way to do it, aren't you?

7 MR. B. CAMPBELL: Just a minute.

8 Mr. Chairman, my friend has already
9 covered this in the transcript previously, and I am
10 looking at the transcript of March 26th, page 21457.
11 He asked Mr. Johansen particularly about his
12 involvement in the Update and the planning and asked
13 whether Mr. Johansen's department had involvement in
14 the preparation of the Update, having already asked
15 about the DSP.

16 And it was pointed out that there was a
17 different unit within the department, planning and
18 programs unit, that was responsible for this, and we
19 have people on Panel 10 to speak to environmental
20 tradeoffs and all of the other tradeoffs.

21 That is where the expertise rests, not
22 with Mr. Johansen.

23 THE CHAIRMAN: That may be, but so far
24 the questions he has asked Mr. Johansen fall within the
25 proper boundaries of this panel. He hasn't gone over

1 the line yet.

2 MR. HEINTZMAN: Q. Can you answer my
3 question, Mr. Johansen?

4 Any time you are making an assessment, an
5 environmental assessment of a particular project or a
6 case or option you are necessarily giving consideration
7 to whether there is a better or a more efficacious way
8 of undertaking that particular plan, aren't you?

9 MR. JOHANSEN: A. Well, it is fair to
10 say that the team -- and let's make it clear that an
11 assessment of a complex undertaking, whether it is a
12 project or a program, is not a one-man effort; it is
13 the effort of a large, multi-disciplined team.

14 And in those project assessments that I
15 have been involved in over the years there has always
16 been, as there was in the case of the DSP, a large
17 input from the system planners.

18 Q. Yes. And, in fact, there is one of
19 those choice documents here in our Exhibit 519. Can
20 you turn with me to page 68? And I don't remember who
21 exactly amongst the five of you put in page 68 of
22 Exhibit 519. Perhaps someone could remind me.

23 MR. PENN: A. I have page 68. It shows
24 the Bruce "A" remaining life cost comparison. That is
25 page 68.

1 Q. Yes. Compared to replacing it with a
2 \$4.5 billion other generating station; right?

3 A. Yes. The purpose of this particular
4 page was to provide a financial test of whether the
5 rehabilitation of Bruce "A", including retubing and
6 other equipment changes and including possible repair
7 and replacement of eight steam generators in Unit 2,
8 was an economic thing to do.

9 Q. And economic --

10 A. And a comparison on a net present
11 value basis was made with fossil capacity and energy.

12 Q. Yes. So this Panel put before this
13 Board a proposal to retube Bruce as opposed to a fossil
14 plant. That is what this document does, doesn't it?

15 A. Well, I had given evidence on the
16 costs of capital modifications of our nuclear
17 generating system that exists today over the years to
18 come to the end of the planning period, and at this
19 point in my evidence I felt it would be responsible to
20 indicate that the rehabilitation of Bruce "A", the
21 capital modifications of it, were indeed economic. So
22 it was the economy that I am looking at here.

23 Q. Exactly. And you are comparing the
24 economy to a new fossil plant, aren't you.

25 A. No -- in part, but not quite.

1 The comparison was with using existing
2 fossil plant that is on our system until it would be
3 possible to bring into service combustion turbines
4 followed by conversion to combined cycle.

5 At the time that each of the units at
6 Bruce "A" reach their retubing that would be the signal
7 to -- or the comparison we are making here between
8 Bruce "A" rehabilitation and fossil generation.

9 Q. Yes. Well, whatever elements are in
10 the fossil generation under the box with \$4.5 billion
11 on top of it, that is a fossil alternative; right?

12 A. It is a fossil alternative.

13 Q. And you are comparing a fossil
14 alternative to a nuclear alternative on the right-hand
15 column under the number \$2.7 billion?

16 A. We are determining whether it is
17 economic and financially sound to rehabilitate Bruce
18 "A", and we are using in this particular example, and
19 this was one example, a comparison with fossil
20 generation.

21 And in my direct evidence I indicated
22 that Panel 10, who were expert in this area, could give
23 further detail on this matter.

24 Q. But this is something that you
25 prepared, Mr. Penn; isn't that correct?

1 A. It is information that was available
2 from System Planning Division in Ontario Hydro. I
3 didn't personally prepare this diagram.

4 Q. Well, this is something you are
5 involved with all the time when you are making
6 decisions as to retube Bruce or do other alternatives
7 involving a nuclear option. You are necessarily
8 comparing them to another option that is available to
9 you, are you not, such as we have on page 68?

10 A. We compare it to what options are
11 available to determine whether a decision is
12 financially sound and economic, yes.

13 Q. Yes. Thank you. And the same
14 applies to you, Mr. Johansen, doesn't it? When you are
15 looking at a particular plan or a particular option or
16 case you are looking at it from the environmental
17 characteristics of that option as opposed to those
18 which would be thrown up by another case and another or
19 better or efficacious way of doing the same thing,
20 aren't you?

21 MR. B. CAMPBELL: Just --

22 THE CHAIRMAN: That question is proper.

23 MR. B. CAMPBELL: I just want a
24 clarification, Mr. Chairman.

25 Is he speaking of Mr. Johansen personally

1 or is he speaking of the Corporation carrying out
2 such --

3 MR. HEINTZMAN: I am talking of these
4 individuals personally. There is no such thing as
5 Ontario Hydro's opinion. The only thing we have is the
6 opinion of these witnesses, and I would like to get the
7 opinion of Mr. Johansen on that point.

8 MR. JOHANSEN: Well, typically in the
9 project-specific environmental assessment in the early
10 stages of a planning program the involvement of my
11 department and people like myself in the department is
12 just that of a team player. We don't have any more
13 weight or role than any number of other people. In
14 fact, the process, the planning process, is dominated
15 by the system planners.

16 When the choice comes down to a
17 recommended or a preferred option that then has to be
18 assessed in some detail for purposes of a submission to
19 our own board of directors or a submission to
20 government for approval it becomes a more singular
21 focus, and it is not a matter of comparing emissions of
22 this option versus emissions of this option.

23 The question is: What are the impacts of
24 this individual project, and do those emissions and
25 other impacts compare favourably against the regulatory

1 requirements?

2 That is the focus that my department is
3 usually involved in.

4 MR. HEINTZMAN: Q. Yes. And when the
5 system planners, who sound like God, come to make these
6 decisions they come to you and your department and say:
7 Now, Mr. Johansen, on CO(2) emissions or radioactivity
8 what is the best way to accomplish what we want to
9 accomplish here, you tell them that to the best of your
10 ability, don't you?

11 MR. JOHANSEN: A. We characterize each
12 option as best we can--

13 Q. Yes.

14 A. --and present that information, and
15 that gets input with all of the other characteristics
16 that come from other disciplines across the
17 corporation, and the system planners then make an
18 overall choice, which is a balance of all those
19 considerations.

20 Q. Absolutely. And if we are dealing
21 with the environmental choices your department or
22 people in your department advise the corporation on
23 those choices from an environmental standpoint, don't
24 they?

25 A. That is fair to say.

1 Q. And you are one of the senior people
2 who helps make those choices; right?

3 A. I guess so.

4 Q. Yes. And when you look at the
5 factors on page 17-17, from an environmental standpoint
6 the people who have to make those choices come to your
7 department and say: Are we making the right choices
8 here from an environmental standpoint? I am not going
9 to ask you to burden yourself with cost, we are not
10 going to ask you to burden yourself with impact on the
11 economy, et cetera, but from an environmental
12 standpoint, are we making the right choice here?

13 And you try help them out, don't you?

14 A. Well, that is right, we do.

15 Q. Yes. Yes. And when you look at the
16 choices that were made so far as selecting Plan 15 it
17 was made on the basis that it had a major impact on
18 reducing acid gas emissions and CO(2) emissions. Isn't
19 that the choice that was made from an environmental
20 standpoint?

21 A. Well, I mean, I would be speculating.
22 It doesn't sound like an unreasonable statement, but
23 the question was never put to us in that way. We
24 provided our assessment at the options and the system
25 planners made a choice.

1 Q. Yes, but let's look at --

2 A. I mean, I can confirm, in answer to
3 your question some time ago, that the characteristics
4 of the nuclear option, which presumably were considered
5 in the final choice, include the fact that the nuclear
6 option, nuclear generation per se does not emit
7 significant amounts of CO(2), does not emit significant
8 amounts of acid gases. And that is it.

9 Q. And from an environmental standpoint,
10 therefore, nuclear generation was selected as the best
11 alternative for base load power?

12 [10:40 a.m.]

13 A. Well, I can't really help you with
14 that. I think Mr. Penn has already answered that
15 question.

16 Q. Would you look with me at Exhibit 4,
17 do you have Exhibit 4?

18 A. Yes.

19 Q. Page 6-15.

20 A. I have got it.

21 Q. Are you familiar with Exhibit 4?

22 A. Yes.

23 Q. Yes. And people, I would suggest, in
24 your department had a large part to play in preparing
25 the environmental analysis.

1 A. That's right.

2 Q. And in setting forth the choices that
3 we see on page 6-15?

4 A. Yes. I should add, however, that
5 although we had a large role if it, we did not control
6 it.

7 Q. You did not control the choices that
8 went into the DSP but you controlled the choices that
9 are set forth in the environmental analysis, that was
10 prepared largely by your department.

11 A. I don't think I can agree with that.

12 Q. How so. Who other than people in
13 your --

14 A. It depends on what you mean by the
15 choices in the environmental analysis.

16 Q. Well, this document, Exhibit 4, is an
17 analysis of all of the environmental issues that should
18 be borne in mind when making a choice between various
19 alternative forms of generation, various cases based
20 thereon; right?

21 DR. CONNELL: Mr. Heintzman, you could
22 help me by telling me on page 6-15, where is the choice
23 here? Is there some element in this table that you
24 interpret as a choice?

25 MR. HEINTZMAN: Yes. If you take the top

1 nine considerations, they are basically environmental
2 issues, that is resource use, emissions, effluent
3 wastes, socio-economic effects. I should say that the
4 top six are environmental and the bottom of the page is
5 socio-economic issues.

6 Q. Do you see those?

7 MR. JOHANSEN: A. Yes.

8 Q. So for the top of the page your
9 department would have advised the planners of those
10 choices.

11 THE CHAIRMAN: I think there is
12 semantical problem here. You are talking about choices
13 and he talks about assessments. As I understand his
14 evidence, they assess these characteristics and pass
15 them onto the planners who then make the choices. The
16 choices are not may at his level.

17 So you are using choices and he is uses
18 assessment and I think you perhaps mean a little
19 different thing.

20 Do you mean assessment?

21 MR. HEINTZMAN: Assessment is a good
22 enough word for me.

23 Q. Take the first characteristic, fuel.

24 MR. JOHANSEN: A. Yes.

25 Q. The authors of this report have

1 preferred -- and we must remember that Case 23 is the
2 most nuclear, Case 26 is the most fossil and Case 15 is
3 an intermediate case but so far as base load is a
4 nuclear generation alternative. So that in each case
5 down to - and let's forget about the socio-economic
6 effects and only deal with the top six - your
7 department set out these assessments for consideration?

8 A. Again, I have to point out that this
9 Exhibit 4 was not the product simply of my department.
10 It was prepared by a multi-disciplined team again
11 including system planning on which we had membership
12 and we certainly had a significant role. But I just
13 wanted to make that clear, it was not a department
14 report.

15 Q. All right. But your department so
16 far as the environmental assessments are concerned has
17 an expertise that the other people don't have.

18 A. Fair enough.

19 Q. Yes. And we look at these
20 assessments, in four of the six cases the assessment
21 has an arrow going to the left indicating that the
22 preference is to the nuclear option and away from the
23 fossil option?

24 A. That's right.

25 Q. In only two of the cases to deal with

1 water use, the third and the fifth is the assessment in
2 favour of the fossil option?

3 A. That's right.

4 Q. So that on a comparative assessment
5 basis, the members of your department and those who
6 work with them, determine that the nuclear based
7 generation alternative was preferable on four out of
8 six grounds over the fossil; right?

9 MR. B. CAMPBELL: Just a minute.

10 MR. JOHANSEN: That would be one
11 interpretation perhaps.

12 MR. HEINTZMAN: Q. Is there any other?

13 MR. JOHANSEN: A. There is no weighting
14 factor on these.

15 THE CHAIRMAN: He just said four out of
16 the six. He didn't put a weighting factor them on.

17 MR. JOHANSEN: Yes.

18 MR. HEINTZMAN: Q. Right?

19 MR. JOHANSEN: A. Yes.

20 Q. That assessment of Case 15 and of the
21 other cases then went into the DSP?

22 A. That's right.

23 Q. And is it not fair to say that from
24 an environmental standpoint and you are wearing your
25 environmental department hat, that what we see here is

1 an assessment that from an environmental standpoint,
2 the choice is in favour of nuclear generation for base
3 load power? That's the net result; isn't it?

4 A. From an environmental point of view,
5 or from the point of view of the factors that you have
6 talked about here, yes.

7 Q. Thank you.

8 Now, let's turn to the third
9 characteristic then, and that is the question of
10 contribution of the economy. I want to turn - Mr.
11 Penn, I will start with you and again anybody can chip
12 in - to page 15-53 of the DSP.

13 Before I leave that point, Mr. Johansen,
14 so far as those criteria that we saw on that page, 6-15
15 of Exhibit 4, those considerations haven't changed
16 between 1969 and the present date, have they?

17 A. I wouldn't think so.

18 Q. No.

19 MR. B. CAMPBELL: Just a minute. It
20 seems to me, Mr. Chairman, that there have been some
21 figures filed relating to -- for instance, if you look
22 at the first box in the upper left, if you looked at
23 the first box of the upper left on that page where the
24 combination of factors that relate to Case 23 are dealt
25 with, it speaks of lowest fossil use and highest

1 uranium use, and if you go down, for instance, to the
2 bottom one that my friend referred to, the six, it
3 talks about lowest ash and highest radioactive waste.
4 If you look at those as capturing the characteristics
5 of Case 23, I would expect that on the basis of the
6 Update those numbers have changed. I would be
7 surprised if figures had not been provided in, for
8 instance, as a result of the LMSTM outputs and so on
9 that have been provided that would change those
10 figures.

11 MR. HEINTZMAN: Those are not dollar
12 figures; those environment figures.

13 MR. B. CAMPBELL: I am about talking
14 waste quantities, FGD, waste.

15 MR. HEINTZMAN: If my friend wants to
16 bring that evidence out in reply I am sure he will be
17 free to do so.

18 THE CHAIRMAN: I am not sure I
19 understand. I am a little bit confused.

20 I think Mr. Johansen's evidence is that
21 those haven't changed. That the number may have
22 changed but it's still the lowest ash FGD, highest
23 radioactive waste, and so on.

24 MR. B. CAMPBELL: I think if my friend is
25 only meaning it in that general sense, I took it as him

1 saying that the figures had not changed.

2 THE CHAIRMAN: No. That assessment would
3 be the same. If they were making those boxes up today,
4 as I understand Mr. Johansen's answer, they would still
5 have the same language in them.

6 MR. B. CAMPBELL: I'm sorry, I
7 misunderstood the question.

8 MR. HEINTZMAN: Q. Let's turn then to
9 the impact on the economy, Mr. Penn, and I would ask
10 you to turn to page 15-53. And we see under the
11 heading Economic Impact - Gross Domestic Product, (GDP)
12 and Employment, an analysis going on to the next page
13 under the heading Economic Impact Balance of Trade of
14 the comparative impact on the Canadian and Ontario
15 economy of a nuclear generation program as opposed to
16 other generation programs as they filter through into
17 the various cases, Case 15, Case 22, Case 24.

18 MR. PENN: A. Yes, that appears to be
19 the case. I would have to read all this in order to
20 understand exactly what messages are being given here.
21 I haven't read this for a long time.

22 Q. Well, you spent some time in your
23 evidence in chief talking about the impact on the
24 Ontario economy and the Canadian economy, and others
25 did on the panel, of nuclear generation, so you are

1 familiar with that subject.

2 A. I spoke at length about the economy
3 and the changes in cost of nuclear generation from our
4 present system between now and the year 2014. I did
5 not talk about the impact on the economy of the
6 province. I talked about the impact on our customers
7 of the cost of generation of the present nuclear
8 system.

9 Q. Well, in your evidence, we can flip
10 it up if we need it, you made the point that a very
11 high proportion of what is needed to produce the
12 elements of the CANDU nuclear program of Ontario Hydro
13 is here and is domestic.

14 A. Yes, I did make that point.

15 Q. And you made that point strongly to
16 the Standing Committee in 1988.

17 A. Yes, I did.

18 Q. And that is a true statement.

19 A. As far as I know, yes.

20 Q. And as far as you know, the nuclear
21 program has a much higher impact on the Ontario economy
22 in terms of additional jobs, employment, balance of
23 trade, then does a fossil program buying coal from the
24 United States. That's fair; isn't it?

25 A. In my general knowledge I do. Again,

1 this detail is a matter of system planning issue. But
2 from the perspective that most of our plant capital and
3 essentially all of our operations and fuel originate
4 inform Ontario, then I believe in comparison to other
5 options, that the impact on our economy by nuclear is
6 the largest.

7 Q. Yes. And that's as true today as it
8 was at the time of the DSP.

9 A. I see no reason for it to change.

10 Q. Right. So that we have now gone
11 through three of the major reasons for going with a
12 nuclear option, Mr. Penn; that is, lowest cost
13 alternative, impact on the environment, and the impact
14 on the economy of Ontario. Would I be correct that the
15 choice today as between a nuclear option and any other
16 for base load is still in favour of nuclear on those
17 bases?

18 A. Well, I think Panel 10 will discuss
19 that with regard to the Update DSP where circumstances
20 have changed. I don't think you can always say, no
21 matter what changes occur in society, that one
22 particular option is always preferred. I don't think
23 that's the case at all.

24 Q. But, sir, you have been involved in
25 this subject for many years and I want your opinion,

1 please, if I may. That when you look at the matter
2 today and you are making a choice from your
3 perspective, that the choice is still in favour of
4 nuclear generation for base load from the perspectives
5 I have given to you, and indeed any other, it remains
6 the best alternative for base load generation; doesn't
7 it, from your perspective and your opinion?

8 A. If there is a need, then the three
9 matters you have mentioned certainly favour nuclear
10 power. But I would point out on page 17-15, and I
11 think this point I am about to make is as true today as
12 it was in 1989, it says on the right-hand column at the
13 bottom of the page, in its comparison of demand/supply
14 plans it says, none of the three demand/supply plans is
15 best in all respects. And then it goes on to look at
16 the chief characteristics, and some of these plans are
17 favoured by some characteristics and some aren't. And
18 then it says on page 17-17, at that particular time for
19 a particular need, the Demand/Supply Plan 15 is
20 selected as the proposed demand/supply plan as it
21 achieves balance in both a quantitative and qualitative
22 sense.

23 Now, those judgments are not made by me
24 as a person that provides the design and the costs and
25 other technical matters. Those judgments are made by

1 the planners at Ontario Hydro which will appear before
2 you after we have given our testimony.

3 Q. That's very true. And in many of
4 those different cases contain nuclear as the base load
5 element, and that's all I am concerned about today, is
6 base load element.

7 Looking at it only then if you wish from
8 your perspective, as somebody who provides design and
9 other criteria for generation, would you agree with me
10 that the assessment today is still that nuclear
11 generation is the preferred alternative for base load
12 generation, if there is a need?

13 [10:55 a.m.]

14 A. If there is a need, I think that
15 nuclear power - and I am speaking personally - is an
16 option that deserves and needs the highest review and
17 regard in its choice.

18 Q. And from your perspective at this
19 time nuclear generation is the best of those
20 alternatives that are presently available, isn't that
21 fair, from all the factors we have reviewed?

22 A. Well, we have only reviewed three
23 factors that I can recall. We have reviewed economics,
24 we have reviewed some, some, environmental issues, but
25 by no means all, and I think -- well, indeed, that

1 amounts to what we have reviewed because we looked at
2 acid gas emissions and carbon dioxide emissions which
3 are clearly both environmental.

4 Q. Yes. Well --

5 A. So as much as I would personally like
6 to see new nuclear power I recognize that in a planning
7 scenario and the requirements of the society that it is
8 not what I might like to see; it's what society will
9 benefit from.

10 THE CHAIRMAN: But what Mr. Heintzman is
11 asking you is what is your own opinion based on your
12 expertise and experience in this area. That's all he's
13 asking you.

14 I realize this is a very difficult issue
15 as between what is the position taken by the proponent
16 generally and what the individual witnesses' views are
17 based on their expertise, but this is what you are here
18 to do. You are here to give us your best opinion so
19 far as you know on what you think is the answer to the
20 question - not what the proponent thinks, or not what
21 others may think, or not what groups think; what you
22 think.

23 Now, I don't know whether Mr. Campbell
24 agrees with that, and if he doesn't he can make
25 submissions on that.

1 MR. B. CAMPBELL: Well, Mr. Chairman, I
2 agree that Mr. Penn and the other experts on this Panel
3 are to give their opinion in the area in which they are
4 qualified.

5 What I keep trying to point out is that
6 there are a whole host -- the evidence is clear that
7 there are a host of considerations that go into making
8 choices.

9 Mr. Penn has been absolutely forthright
10 that from the point of view of CO(2) emissions, acid
11 gas emissions, slightly from the point of economics,
12 and from those perspectives looking at it in that very
13 limited sense, that there are advantages to nuclear. I
14 don't disagree with questions in that regard. I don't
15 object to them.

16 What I object to is that these answers in
17 that very limited sense have very little -- in my
18 submission are of very little value to the Panel in
19 that the choice that has to be made before this Panel
20 is not limited to anything like that narrow a band of
21 issues. The choices cover a full range of issues that
22 are going to be dealt with in Panel 10.

23 And my friend is, in his usual way, very
24 clever at trying to move into all of those areas, but I
25 take a fundamental objection to the fact that we have

1 got to have some order in presenting the case and it is
2 of very little probative value to the Panel to have the
3 witnesses saying, well, in my personal view on a very
4 narrow range of issues, yes, there is a preference this
5 way or that way.

6 That is my objection. I just don't think
7 it is a good use of your hearing time and it has no
8 probative value whatsoever in the issues at the end of
9 the day.

10 MR. HEINTZMAN: Well, in my respectful
11 submission it will have a great deal of probative
12 evidence, and that the only thing that this Board is
13 going to be able to rely upon, are the opinions of
14 those people who are called before you, and it is those
15 opinions that you will have to listen to and give
16 credence to, or not, depending on which you find to be
17 most persuasive.

18 MR. B. CAMPBELL: My point is when you
19 try to balance all the factors that go into the point,
20 as Mr. Penn has pointed out, there is a whole range of
21 discussion there about trying to balance advantages,
22 disadvantages, and my friend has been careful to point
23 out this advantage, and this advantage, and this
24 advantage.

25 If everyone agreed that what he said was

1 an advantage and had no offsetting disadvantages, then
2 we could all go home, but that's not the case. It has
3 to be balanced, and the people who are going to give
4 opinion evidence on the appropriate way to try and
5 balance those things and how they have gone about doing
6 that are not this panel. That surely is clear.

7 THE CHAIRMAN: But Mr. Penn who has spent
8 his career in this technology can certainly be asked to
9 give his opinion as to the characteristics of that
10 technology as opposed to other technologies to the
11 extent he is able to do that.

12 MR. B. CAMPBELL: I have not objected
13 once, Mr. Chairman, to a question that was related to a
14 characteristic.

15 What I do object to is questions that
16 relate to taking those characteristics and trading them
17 off against characteristics of other options and coming
18 up with judgments on an appropriate course of action to
19 advocate before this Board. That is not what this
20 panel is for.

21 On the characteristics I have not taken
22 any objections.

23 THE CHAIRMAN: All Mr. Heintzman has
24 asked Mr. Penn at this moment is if in his opinion
25 based on the evidence that he has given about the base

1 load characteristics, the environmental
2 characteristics, and the economic characteristics of
3 this particular option is he of the view that it is
4 preferable for base load operations to any other
5 alternative. That's all he has been asked.

6 And he can say "yes" or "no" to that or
7 "I don't know."

8 MR. B. CAMPBELL: If it is limited --

9 THE CHAIRMAN: I hope I have that --

10 MR. HEINTZMAN: Exactly.

11 MR. B. CAMPBELL: Well, my objection to
12 the question, Mr. Chairman, is simply that I don't see
13 how not having the full range of considerations before
14 you that that answer can help you at all.

15 THE CHAIRMAN: It is limited to those
16 three factors, as I understand it, based on those three
17 factors there. There may be other factors that have to
18 be considered and thrown into the pan, but those are
19 the three factors that have been asked up until now.

20 MR. B. CAMPBELL: On the basis of those
21 three factors, Mr. Chairman, if you think the answer is
22 useful to you then my submission will be defeated. It
23 is simply that I don't think at the end of the day that
24 that simple answer is very much help to you, and I --

25 THE CHAIRMAN: That's a matter for

1 argument.

2 MR. HEINTZMAN: Q. Mr. Penn, based upon
3 those considerations and if you were advising the
4 planners and they come to you and say, okay, which
5 option do we go with for base load, would I be correct
6 that you would advise them at this time to go with
7 nuclear as the base load option?

8 MR. PENN: A. Well, before I answer that
9 question I must point out that the system planners
10 don't come to me and say, please provide me with your
11 opinion on base load power for a certain point in time.

12 They come to me for specific information
13 so that they can weigh it with all the other
14 information to determine from the point of view of
15 borrowing, from the point of view of impact on the
16 rates, point of view on the impact on the debt, point
17 of view of reliability of supply, where the fuel is
18 coming from, what its environmental impact is, and so
19 many other things.

20 Now, if I understand, Mr. Chairman, you
21 want me to answer the question, what is my personal
22 view given the characteristics only of the environment,
23 and the economics of nuclear power and the impact on
24 the economy of this province alone, I would have to
25 answer that for Ontario that nuclear power is the

1 preferred base load option.

2 But clearly it depends upon what balance
3 of generating supply we have at our disposal. We would
4 not put all our eggs in one basket.

5 Q. Well, there may be good reasons for
6 not going with the best alternative, and that would be
7 one of them, that you don't want to have all your
8 eggs --

9 THE CHAIRMAN: I think you have done all
10 right. [Laughter]

11 I don't think you need to pursue this
12 particular line any farther.

13 MR. HEINTZMAN: Q. Well, I would like to
14 pursue it this much further. Does any member of the
15 panel dissent from the view that Mr. Penn has expressed
16 from his vantage point?

17 Hearing none, I will take it that there
18 are none.

19 Now, I want to then turn to another point
20 that is related to that, Mr. Penn, and that is a
21 comparison of the cost of nuclear generation to the
22 Manitoba Purchase. Were you involved in considering
23 the cost of the nuclear option to the option of
24 purchasing power from Manitoba?

25 MR. PENN: A. I was not involved in any

1 aspect of the Manitoba Purchase.

2 Q. And insofar as you are involved - and
3 I am just directing this to you and to the panel
4 generally, that you were involved in nuclear generation
5 and that alternative - did you become aware of the fact
6 of whether or not nuclear generation was a least cost
7 alternative or a lesser cost alternative to the
8 Manitoba Purchase either at the time that the initial
9 contract was made with Manitoba or now?

10 A. I am not aware of any of comparisons
11 between the cost of nuclear and the purchase of power
12 from Manitoba?

13 Q. Well, then, we will come back to that
14 with others, or we have already got that from others.

15 Now, I want to then turn, Mr. Penn, to
16 the next subject, and that is the question of
17 expenditures on operations, maintenance and
18 administration, and you and I touched upon this
19 earlier.

20 I noted in Exhibit 534, which was your
21 speech or presentation to the Select Committee in 1988,
22 as a point of departure on this subject on page 15 in
23 the fourth paragraph--

24 A. Yes?

25 Q. --that you told the Select Committee:

1 Ontario CANDUs have declined in
2 reliability on an annual basis. This is
3 due in part to the retubing of Pickering
4 NGS units. It is also associated with
5 much lower operation and maintenance
6 expenditures compared with other systems
7 and countries.

8 And that was a true statement at that time?

9 A. Yes.

10 Q. And we saw in one of the OECD studies
11 that we looked at yesterday that Ontario Hydro has been
12 spending considerably less than even other countries
13 which have multi-unit stations, such as France, on
14 OM&A?

15 A. It was certainly less. I didn't
16 think it was considerably less, but it was less, yes.

17 Q. Well, the number was 15.1 to 28, I
18 think, if we look back at that. Do you want to look at
19 that exhibit?

20 A. Well, my memory, it was 23, but I
21 will stand corrected.

22 Q. Let's just check it. Exhibit 533.

23 A. Was this in the UNIPED document or
24 in the OECD document?

25 Q. OECD document, Exhibit 533, page 74,

1 is comparing Canada with France.

2 My reading is 15.1 if we look across the
3 "N" or Nuclear line for Canada Central, to 28.3 if we
4 look across the France "N" for Nuclear line.

5 A. That is correct. I note that the
6 French station is a two-unit station whereas the figure
7 for Ontario Hydro was a Darlington-type station.

8 Q. But it is 2 times 1,390 station?

9 A. Yes, it is one of the French standard
10 series of plants.

11 Q. Yes.

12 A. But there are two units, that is the
13 point I am making, as opposed to four units.

14 Q. But there is a marked difference
15 between 15.1 and 28.3?

16 A. There is no question that our costs
17 are lower, yes.

18 Q. Yes. And I want to look at
19 Interrogatory 9.2.73.

20 I put before the Board, I hope, a booklet
21 containing the interrogatories to which I anticipate
22 referring, and I hope that tab 3 will be the one that I
23 want to refer to, namely, 9.2.73, and would ask that
24 this booklet be given an exhibit number if it might,
25 Mr. Chairman.

1 THE CHAIRMAN: Does this contain nothing
2 but interrogatories?

3 MR. HEINTZMAN: Just interrogatories,
4 yes.

5 THE CHAIRMAN: The better way would be to
6 key them to the interrogatory exhibit for this Panel.

7 MR. HEINTZMAN: Can we then call it,
8 9.2.73, the next exhibit in that booklet?

9 THE CHAIRMAN: Which is that?

10 THE REGISTRAR: I am at a bit of a loss.
11 The interrogatory number you were requiring?

12 THE CHAIRMAN: Yes, the next
13 interrogatory.

14 THE REGISTRAR: It will be 520.30.

15 ---EXHIBIT NO. 520.30: Interrogatory No. 9.2.73.

16 MR. HEINTZMAN: Q. And if we can turn to
17 the first document in Exhibit 520.30, that is a speech
18 or presentation by Mr. E.P. Horton, and if you look at
19 the bottom of the first page it was given to an
20 international symposium on April the 17th to 21st, 1989
21 in Tokyo, Japan.

22 MR. PENN: A. Yes.

23 Q. And if we could turn to page 5 of
24 that document under heading seven, Cost Management
25 Initiatives, under the first full heading, The

1 Evaluation of Quality of Operation, the document says:

2 The application of the cost management
3 strategy in the 1970s led to a very
4 positive first decade in terms of Ontario
5 Hydro's nuclear performance. However,
6 declining load growth and general
7 resource constraints in the early 1980s
8 during the completion of a large nuclear
9 construction program led to the
10 corporation's inability to continue to
11 provide all the resources requested by
12 the operating organization. Nuclear
13 plant aging, backfitting modifications to
14 meet regulatory requirements and
15 increasing regulatory and reporting
16 requirements were also occurring.
17 Ontario Hydro faced a backlog of work and
18 some evidence of deterioration in plant
19 performance. A formal evaluation process
20 based on the U.S. Institute of Nuclear
21 Power Operations (INPO) program was
22 initiated using teams of evaluators from
23 central support groups and sister plants.
24 These evaluations confirmed that overall
25 quality of operation was not at the

1 standard desired. The findings included
2 areas requiring changes in management and
3 procedure and indicated a need for
4 significant increases in operating and
5 maintenance resources.

6 [11:15 a.m.]

7 That's all a correct statement is it, so
8 far as are you aware?

9 A. So far as I am aware, yes.

10 Q. And it continues - and Mr. Daly may
11 wish to comment on any of this - where it says:

12 Precursors to future performance on
13 the basis of increased evidence of
14 declining quality of operation, even
15 though major objectives in the key
16 effectiveness areas were being met, study
17 was undertaken to determine a useful set
18 of precursors of future performance.
19 Areas such as backlogs of deficiencies
20 and required modifications, number of
21 temporary modifications and number of out
22 of date procedures were exempt. In many
23 cases results did not meet expected
24 standards.

25 And that's all correct as far as are you

1 aware?

2 A. Yes.

3 Q. And under the next heading on page 6,
4 the third paragraph refers to a cost and performance
5 model which has been developed. You will see that in
6 the last sentence of the third paragraph under the
7 heading Operating Costs and Performance Analysis. And
8 if you turn with me to --

9 A. You are referring to EUCG, are you?
10 Is that what you are referring to?

11 Q. No. The third paragraph says:

12 Examinations by various researchers in
13 the past into the relationships between
14 operating costs and performance have
15 yielded mixed results.. However, Ontario
16 Hydro's investigations have yielded
17 statistically valid indications that its
18 operating costs and performance are
19 correlated, based on these indications a
20 cost and performance model has been
21 developed.

22 Do you see that?

23 A. Yes. This paper is describing
24 exactly that analysis.

25 Q. Yes. And if you refer to two further

1 pages onwards you will come to a page that has a figure
2 3 with a graph with nuclear operating costs in the
3 bottom and overall system cost of generation on the
4 left-hand side.

5 A. Yes.

6 Q. And that's the model that Ontario
7 Hydro developed, I understand it.

8 A. It's based on that concept, yes.

9 Q. And the model shows us that if you
10 are down in a low nuclear operating costs area, that
11 the overall system cost of generation can shoot up, as
12 we see in the left-hand side of the graph,
13 dramatically?

14 A. Yes.

15 Q. And the object is to have yourself at
16 the dot at the bottom of the curve and not somewhere to
17 the left of that, up where by being penny wise with
18 nuclear operating costs you might be pound foolish with
19 respect to overall system cost of generation.

20 A. You want the optimum, yes.

21 Q. Yes. And what this paper is telling
22 us, that Ontario Hydro, by spending less on operating
23 costs, was findings itself on that rising curve of
24 overall system cost of generation to the left of the
25 optimum?

1 A. Well, it was finding itself with
2 reducing capacity factors in the "A" type plants, yes.

3 Q. Yes, and that is said on page 6 of
4 this paper, the second paragraph after the one we just
5 read, where it says:

6 A particular interest is the rapidly
7 rising system costs when operating at
8 lower than optimum nuclear resource
9 levels. This is due not only to
10 deterioration in equipment performance
11 but also to the risk of extended shutdown
12 for other than equipment problems.

13 Correction of unacceptably poor quality
14 of operation can be difficult and time
15 consuming and may affect all units in a
16 multi-unit station.

17 That was the point that was being made by
18 Mr. Horton in his paper?

19 A. Yes.

20 Q. Now, that is the part that I wanted
21 to refer you to on that subject, but just while we are
22 on it, this paper does list the benefits of the CANDU
23 design on pages 7 and 8, and if we could just note it
24 while we are going by, in about the fourth paragraph it
25 says:

1 The CANDU design was selected because
2 of the ability of Canadian industry to
3 participate substantially in the
4 technology and manufacture of equipment
5 and systems. CANDU's use of indigenous
6 natural uranium avoided the complexities
7 and costs of enriching uranium. CANDU
8 also offered the potential for easy
9 adaptability to more advanced fuel
10 cycles.

11 And then it refers to the financial
12 benefits under the heading -- you will see them under
13 the line low generating costs, electricity price
14 stability, nuclear versus coal cost savings, balance of
15 payments impacts, revenue enhancement and future
16 financial benefits.

17 Those are the factors referred to by Mr.
18 Horton as being the advantages of the CANDU program?

19 A. Yes. I think they are well
20 substantiated in the literature.

21 Q. And other benefits to the economy,
22 environmental protection, employment, technology
23 spinoffs, reliability and energy supply security. Are
24 those also substantiated in the literature, in your
25 view?

1 A. Just let me read them for a moment,
2 please.

3 Q. Certainly.

4 A. Well, some of these are statements of
5 fact at the time this was written, so I am not sure
6 that they would be fully substantiated in the
7 literature, but as far as I can determine these
8 comments are correct.

9 Q. And then the next document attached
10 to this interrogatory is a memorandum to the Board of
11 directors of Ontario Hydro, and if you could come
12 forward to that. And this, on the first page we see,
13 was recommending that the board of directors approve an
14 increased hiring program for nuclear operations
15 departments, and requiring additional OM&A funds in the
16 amount of \$13 million for 1988, et cetera. That was
17 the purpose of this document to the board of directors?

18 A. Yes, it's dated May 1988.

19 Q. Yes.

20 A. In my direct evidence I indicated
21 that OM&A costs have an increased from 1988 onwards in
22 order to improve the performance of our nuclear
23 stations.

24 Q. Were you involved in putting together
25 this recommendation or the attachments to it?

1 A. No.

2 Q. Were you, Mr. Daly?

3 MR. DALY: A. I had some involvement in
4 preparing some of the supporting statistics.

5 Q. We will be coming to those.

6 In paragraph 1 of the Executive Summary,
7 it notes that at the January meeting the board approved
8 a budget, and then it says:

9 Subsequent to the preparation of the
10 budget there has been further examination
11 of the adequacy of this level of funding
12 and staff.

13 And comments on that in paragraph 2 say
14 that:

15 A significant staff increase is
16 needed in 1988 in order to fill certain
17 positions, required to: (1) return all
18 nuclear operating departments to good
19 operations levels.

20 That was one of the reasons that this
21 recommendation was being made?

22 A. Correct.

23 Q. And we see in paragraph 5 of the
24 recommendations, or Executive Summary, that there was a
25 growing backlog of OM&A funded work. Also, the gap

1 between Ontario Hydro nuclear operations OM&A dollars
2 and staff levels and comparable international resource
3 levels continues to widen.

4 That was one of the statements that was
5 addressed to the board of directors?

6 A. Right. And that had been a growing
7 concern for us over the previous years.

8 Q. Because of the deteriorating
9 performance based upon international comparisons that
10 we have seen from what they had been in the early
11 1680s?

12 A. Correct.

13 Q. And this document sets out those
14 matters in some detail, and particularly on page 11
15 notes under the heading Deficiencies:

16 A growing backlog of deficiencies
17 increases the risk that one or a
18 combination of the deficiencies will
19 worsen and impact on key result areas
20 such as worker and public safety. The
21 risk is also an increased because the
22 general condition of the station is
23 worsening making it more difficult to
24 operate for the operators.

25 That was one of the points being made to

1 the board?

2 A. Yes.

3 Q. And if we can turn to page 17 to get
4 an idea of the difference between the levels of
5 expenditures by Ontario Hydro and others, we turn to
6 paragraph A.2, entitled Growing Gap Compared to
7 Expenditures and Staff Levels in the United States. It
8 says:

9 As noted in the submission to OEB --
10 That would be the Ontario Energy Board,
11 Mr. Daly?

12 A. Yes.

13 Q. In 1987, external comparisons are
14 useful for assessing relative performance
15 in the areas of cost, staff and
16 reliability. This section will add 1986
17 data to the trend presented in 1988 to
18 demonstrate the increasing difference in
19 staff levels and OM&A expenditures
20 between Ontario Hydro nuclear operations
21 and the United States nuclear stations.
22 For comparison purposes the costs are in
23 constant 1985 dollars.

24 And then we have a chart entitled Figure
25 A.2.1, comparing Ontario Hydro in the left column, in

1 each case to EUCG, which is the American group of
2 generators which includes Ontario Hydro, but these
3 numbers have excluded Ontario Hydro, as I understand
4 it?

5 A. Correct.

6 Q. Showing that in Canadian dollars per
7 megawatthour, for instance, Canada is at -- or Ontario
8 Hydro, I should say, is at 4.2 in 1985 and the American
9 members of this organization are at 15.9 dollars,
10 Canadian dollars per megawatthour?

11 A. Right, that was the situation that
12 the time.

13 Q. Yes. Which is 3-1/2 times, as I can
14 calculate it, what Ontario Hydro was spending on OM&A
15 per megawatthour in 1985.

16 A. Correct.

17 Q. And in 1986 we are at a situation
18 where its 3.7 Canadian dollars per megawatthour and the
19 Americans are at 15.7, which my calculation is 4-1/4
20 times when Ontario Hydro was spending.

21 A. Correct. We did have some economies
22 of scale due to the multi-units; however, we were
23 concerned that even taking into account the economies
24 of scale we were a bit low.

25 Q. And that point is made further on and

1 we will come to it.

2 Looking at it from a capacity standpoint
3 at the bottom of the page, figure A.2.2 again, we see
4 Ontario Hydro at 24.8 dollars per kilowatt and the
5 Americans at 71.3 Canadian dollars per kilowatt in
6 1985; is that right?

7 A. Yes.

8 Q. And Ontario Hydro at 22 Canadian
9 dollars per kilowatt and the Americans at 81.5 Canadian
10 dollars per kilowatt in 1986?

11 A. Right.

12 Q. And at the bottom of page 19 in staff
13 units, the point is made - I am just reading of the
14 paragraph immediately before the heading at the bottom
15 of page 19 - it says:

16 The growth in the U.S. staff levels
17 from 1985 to 1986, further distances them
18 from the Ontario Hydro levels which are
19 decreasing.

20 That's what this report states.

21 A. Yes.

22 Q. And under figure A.2.4, again showing
23 the difference in staffing based on megawatts this
24 time, the authors state:

25 Opinions vary from the extremes that

1 Ontario Hydro nuclear operations is much
2 more efficient than the American nuclear
3 utilities, to Ontario Hydro being grossly
4 underspent relative to true needs. The
5 truth probably lies somewhere between.
6

7 A. Yes, I continue to support that
8 statement, yes.

9 Q. And the next paragraph says:

10 The backlog of work and the increase
11 of outage extensions testify to the need
12 for more staff in Ontario Hydro nuclear
13 operations.

14 A. Right. And that was what this
15 particular document was all about.

16 Q. Yes. And the point that you were
17 making is dealt with at the bottom of page 21 where the
18 graphs try to compare staffing at single unit plants,
19 double units plans, triple unit plants, and then
20 Ontario Hydro's plants on the right-hand side, and the
21 authors then say:

22 Examination of these graphs show that
23 Ontario Hydro's reduced expenditures are
24 contrary to those of the U.S.
25 installations. Projecting the

1 relationship curve for the single, double
2 and triple unit plant values extrapolates
3 to a fourth unit value well above that
4 which Ontario Hydro is spending.

5 A. Right. And that had been a growing
6 recognition for us over the previous few years.

7 Q. And at the top of page 22 dealing
8 with curves, on page 22 we have curves showing the
9 various amounts spent by Ontario Hydro compared to the
10 U.S. mean, the U.S. maximum and the U.S. minimum.
11 These are hard to read, but you will see the round dots
12 of Ontario Hydro starting above the U.S. mean and then
13 crossing over the U.S. mean at about 1979 and then
14 crossing over the U.S. minimum in about 1984.

15 A. Correct.

16 Q. So that Ontario Hydro was spending
17 more than the U.S. mean and minimum in the early years,
18 and by the end it's spending less than either the U.S.
19 mean or the U.S. minimum?

20 A. Yes.

21 Q. And that's what it says at the top of
22 page 22 where it says:

23 Figure A.2.7 shows the data with 1986
24 added Ontario Hydro was spending as much
25 as the average U.S. station until 1979.

1 Since 1984 Ontario Hydro's spending has
2 fallen below that of the minimum U.S.
3 station expenditure.

4 A. I should add one point there. Some
5 of the spending on the U.S. utilities increased
6 significantly after Three Mile Island where they had to
7 put in various back-fits and so on, which accounts for
8 some of the U.S. increase.

9 Q. And before we leave this document,
10 and perhaps the last thing we can do before the break,
11 the next paragraph says:

12 A study using a high quality
13 regression model linking OM&A spending to
14 capability factors shows that
15 approximately \$10 million to \$20 million
16 more OM&A spending is required each year
17 at each of our four unit stations to
18 minimize corporate costs, including that
19 of replacement fuel costs associated with
20 non-nuclear generation. It does not
21 however cover the spending that is
22 required to reduce backlogs of work which
23 would increase the required aggregate
24 spending markedly. Therefore, the
25 resources requested here are still on the

1 low side of optimum.

2 A. Right. And in subsequent budgets and
3 business plans we had asked for some additional
4 resources.

5 MR. HEINTZMAN: Would this be a
6 convenient time for a break, Mr. Chairman?

7 THE CHAIRMAN: Thank you. We will break
8 for 15 minutes.

9 THE REGISTRAR: This hearing will recess
10 for 15 minutes.

11 ---Recess at 11:30 a.m.

12 ---On resuming at 11:56 a.m.

13 THE REGISTRAR: Please come to order.
14 This hearing is again in session. Please be seated.

15 MR. HEINTZMAN: Q. Mr. Daly, I have
16 handed you a document which I understand is somewhat in
17 the nature of an update to the document that was given
18 to the board of directors in 1988. This one is dated
19 April, 1991, entitled Nuclear Station Operating Costs,
20 Ontario Hydro and the U.S. Nuclear Industry, 1988-89.

21 Is that the nature of this document?

22 MR. B. CAMPBELL: Well, just a minute,
23 Mr. Chairman.

24 I have just received this, and I notice
25 that on --

1 THE CHAIRMAN: You are ahead of me
2 because I haven't got it.

3 MR. HEINTZMAN: Sorry.

4 MR. B. CAMPBELL: I had no idea my friend
5 was going to be referring to any document of this type.

6 I noticed, having simply looked at the
7 front cover, that it is marked For Official Use Only,
8 Restricted, and I believe that glancing into it, it
9 refers to electricity utility cost group information.

10 I happen to know from appearing for Hydro
11 on other matters that there are contractual
12 restrictions on Ontario Hydro's ability to publish
13 data, some of the data that is available to it only on
14 the basis of other utilities' operating data being held
15 confidential by Ontario Hydro.

16 I have no idea, because I have had no
17 warning whatsoever as to that this document was going
18 to be referred to, as to whether that is the rationale
19 for the restriction, but I think before it is made an
20 exhibit or distributed I should be allowed the
21 opportunity to make those inquiries.

22 As I say, I am aware of the fact that
23 some information when Hydro is a member of these types
24 of organizations is only available to Hydro on the
25 understanding that it is only published with the

1 permission of the group.

2 MR. HEINTZMAN: I am quite happy to come
3 back to it later if my friend wants to look into that.

4 THE CHAIRMAN: All right.

5 MR. HEINTZMAN: So I will defer it for
6 the moment.

7 MR. B. CAMPBELL: And I would ask that it
8 not be distributed until that is done because I have no
9 idea whether in permitting it to be distributed Ontario
10 Hydro could be taken to be in breach of contractual
11 relationships.

12 MR. HEINTZMAN: I will come back to it
13 when my friend gets back to me.

14 Q. What I have done, Mr. Daly - and I
15 would ask that this document be provided to you - I
16 have tried to put onto one page two graphs from Exhibit
17 519 or parts of two graphs from Exhibit 519.

18 THE CHAIRMAN: Should this graph be
19 marked as an exhibit?

20 MR. HEINTZMAN: Could it be the next
21 exhibit?

22 THE REGISTRAR: Number 537, Mr. Chairman.

23 ---EXHIBIT NO. 537: One page bearing two graphs from
24 Exhibit 519, being parts of two graphs
from Exhibit 519.

25 MR. HEINTZMAN: Q. Perhaps you could

1 turn in Exhibit 519 -- and you will have to turn it
2 sideways so you can compare them, but what I have
3 sought to do is to plot pages 26 and 69, and when I say
4 page 26 of Exhibit 519 I mean the Ontario Hydro line.

5 Page 26 is a comparison of Ontario
6 Hydro's capacity factor performance with that of
7 pressurized water reactors and boiling water reactors,
8 so I have only taken the Ontario Hydro capacity factor
9 line and I have then put that in red and then charted
10 the same -- or charted page 69, which is the OM&A costs
11 that are set forth on page 69, through the same period.

12 MR. DALY: A. I understand.

13 Q. And in looking at that is it fair to
14 say that we can see a fairly graphic correlation
15 between what Ontario Hydro has been spending for OM&A
16 and the reactor capacity performance?

17 A. I wouldn't call it a complete
18 correlation because there were other factors. For
19 example, the reduction in capacity factor started
20 significantly in 1983 when we had the Pickering
21 pressure tube leak, so I would agree that budget
22 restraints were one factor, but, however, it was not
23 the only factor.

24 Q. I understand that, but in terms of
25 correlation we could see starting just before 1981 the

1 expenditures on OM&A turning down and capacity turning
2 down?

3 A. Right. I think, you know, to get a
4 full correlation you have to look at all the factors
5 behind both curves, and while I would agree that the
6 capacity factor started dropping off at the time that
7 the budget restraints started to come in we, as I say,
8 started shortly to get into pressure tube problems.

9 So to get a full correlation you have to
10 look at all the factors.

11 Q. And then again between 1982 and 1983
12 we can see both the capacity factor and the OM&A
13 expenditures take a more steep drop at about that time
14 period?

15 A. Right. That's what the figures show
16 us.

17 Q. And then when the budget restraints
18 come off in about 1987 through 1988 and expenditures on
19 OM&A start to go up dramatically then performance
20 starts to pick up about 1990, capacity performance?

21 A. But only in 1990.

22 Q. Only in 1990.

23 A. Between 1990 and '91, yes.

24 Q. You would expect some lag time
25 between the moneys that you spent on OM&A and reactor

1 performance, wouldn't you?

2 A. Yes, we do expect some lag time,
3 typically sort of two to three years. However, as I
4 say, there were other factors going on in the '88 to
5 '91 period. Darlington, for example, is included in
6 those figures, so Darlington has an effect there, too.

7 Q. I then, Mr. Daly, want to turn to the
8 same subject but dealing with the way it was handled in
9 the Ontario Nuclear Cost Inquiry, both your
10 presentation or Ontario Hydro's presentation to that
11 inquiry and the report of the Minister, and for that we
12 will need Exhibits 43 and 44, if you have those
13 available to you.

14 A. I have one. I have the Ontario Hydro
15 presentations. I don't have the other.

16 I think we have both now.

17 Q. Good. Could you turn with me in
18 Exhibit 43, the Ontario Hydro presentations, to Ontario
19 Nuclear Cost Inquiry, to page 192, paragraph 27.8?

20 A. I have got that.

21 Q. And this is where Ontario Hydro was
22 advising the inquiry about these restraints that had
23 suppressed OM&A expenditures?

24 A. Yes.

25 Q. And I think we can take it as read,

1 but paragraph .2 refers to backlogs being in
2 preventative maintenance, operating and training manual
3 revisions, insulation and testing of modifications,
4 repair of systems and equipment deficiencies, et
5 cetera.

6 The concern is that backlogs are
7 precursors of declining station performance?

8 A. Right.

9 Q. Furthermore, there have been
10 instances in the recent past where
11 restrained resources resulted in delays
12 in the completion of outages in spite of
13 the use of all available overtime. Thus,
14 station capacity factors have to some
15 extent been directly affected by
16 restrained direct OM&A expenditures?

17 That is what you were telling the inquiry?

18 A. Yes.

19 Q. And in paragraph .4 on the next page
20 you conclude this part by saying:

21 In other words, budget restraint may
22 have reduced overall costs in the short
23 term. The concern, of course, is that
24 such restraints will increase longer-term
25 costs.

1 That is what you advised the inquiry?

2 A. I should say, I didn't make this
3 particular presentation, but nevertheless I agree with
4 what has been said.

5 Q. Mr. Tribou, is he from your area
6 or --

7 A. He was in the same department as I
8 was at that particular time.

9 Q. And then if you could turn with me to
10 the inquiry's report, Exhibit 44, turning to page 53, I
11 would like to read paragraph 7.3, sub-paragraph 2, and
12 understand exactly what the panel was saying to Ontario
13 Hydro, if I can.

14 They say:

15 A contributing factor to Hydro's low
16 OM&A costs when expressed as LUEC is the
17 high capacity factor of its nuclear
18 stations. Most of the OM&A annual costs
19 are fixed and do not vary with the amount
20 of energy produced. Thus, the fixed
21 annual costs are distributed across a
22 larger number of kilowatthours resulting
23 in proportionately lower unit energy
24 costs even though the total annual cost
25 may be fixed.

1 Now, you will see in the prior paragraph
2 that the inquiry expresses concern about this area of
3 costs. While commenting that it is lower than the U.S.
4 nuclear plants, the panel then ends up saying there is
5 uncertainty in the OM&A costs; maintenance requirements
6 may increase due to aging of equipment and that Hydro
7 should assess this component of costs.

8 As I understand what the report is saying
9 and the panel is saying is that if you keep the
10 capacity factor of your nuclear stations high then your
11 OM&A costs are going to be relatively small.

12 A. Based on the history they had seen if
13 we could keep the capacity factors high, yes.

14 Q. So that they are saying even though
15 the capacity, the low OM&A costs are there as expressed
16 as a LUEC, that is because of the high capacity factor
17 and only will remain as such if you keep the capacity
18 factor high, and if that capacity factor is allowed to
19 deteriorate then you are going to have higher OM&A
20 costs?

21 A. Well, the two kind of go together.

22 In the particular period they were
23 looking at in the early 80s we had high capacity
24 factors and generally low cost, but if the capacity
25 factor were to deteriorate then the unit energy costs

1 would go up. So the two are related.

2 Q. Exactly. So that if you spend less
3 money on OM&A in fact your OM&A costs may go up if your
4 capacity goes down?

5 A. Yes. As you said earlier, there is a
6 time lag effect, and if we were to underspend on OM&A
7 there might be no visible sign of this through capacity
8 factor for two or three years, but, generally speaking,
9 underspending or overspending will catch up with you in
10 time.

11 Q. So that the panel is really saying
12 that you can spend money on OM&A to keep up your
13 capacity factors and that will keep down your average
14 OM&A cost?

15 A. Essentially, yes. And we had
16 basically reached the same conclusion ourselves, and
17 that is why we initiated the board memo we had
18 previously discussed and why the corporation had funded
19 this restore and maintain good performance program.

20 Q. If we could go back to Exhibit 519 to
21 that page 26 that I asked you to look at when I put
22 them together into Exhibit 537, if we look at that
23 graph for Ontario Hydro, as we look across the page I
24 suggest to you that there is every reason to expect
25 that Ontario Hydro's performance would have and could

1 have stayed up at the range we see between 1975 and
2 1983 where it is well above 80 per cent if Ontario
3 Hydro had been spending the kind of OM&A dollars that
4 the people who were operating the pressurized water
5 reactors and boiling water reactors spent, and we see
6 that their performance has stayed relatively even
7 between 60 and 65 per cent.

8 A. I can't fully agree with that, Mr.
9 Heintzman.

10 I think even had we kept the OM&A funds
11 up I think the chances are we would have had the
12 pressure tube failure on Pickering in 1983 with all the
13 additional inspections and pressure tube replacements
14 that that led to.

15 So I think that had we kept the funding
16 up during this period certainly it would have improved
17 performance somewhat, but I think we would still have
18 seen the decline in performance led by the need to
19 retube and do the additional work on pressure tubes.

20 So it is not a single-factor correlation.

21 Q. All right. Well, now, we hope we
22 have got the pressure tube problem licked and you now
23 can retube them, we will see, and we have seen, in
24 something like 19 months, to retube Pickering 4, I
25 think it is.

1 A. That is the scheduled time for
2 Pickering 4, and they are slightly ahead of schedule at
3 the moment, yes.

4 Q. So let's look at the proposition I
5 put to you prospectively then if we can't look
6 historically.

7 Isn't, when we look at page 26, there
8 every likelihood that if you spend equivalent amounts
9 of dollars on your CANDU reactors that you will be able
10 to have them operating in the 80 to 85 per cent
11 capacity area as they operated between about '75 and
12 1983?

13 A. That is certainly our intent and our
14 target, as I indicated yesterday, and the funding is
15 towards that target.

16 Also, in particular at Bruce "A" we have
17 to get through a significant period of retubing and
18 rehabilitation at Bruce "A" over the next 10 to 15
19 years before, for example, Bruce "A" would be up at
20 those sort of levels.

21 Q. Whereas anybody looking at these
22 charts would conclude that with that kind of OM&A
23 program the other two kinds of reactors are performing
24 in the vicinity of 60 to 65 per cent on an historical
25 basis?

1 A. Right. Of course, these are average
2 figures and reflect, you know, a wide range of utility
3 performance.

4 Q. So that we can see a fairly dramatic
5 difference in capability performance between the CANDU
6 with an equivalent amount of OM&A expenditure and the
7 other two types of reactors?

8 A. Well, I go back to what I provided in
9 my direct evidence. You saw the history there; you saw
10 the comparison with the States. The history is fact.
11 And I also showed our projections for the future.

12 And certainly, we do plan to get above
13 the U.S. average in fairly short order.

14 Q. So I take it you are agreeing with
15 me, that you can expect a high degree of performance,
16 80/85 per cent from a CANDU reactor if you spend that
17 kind of OM&A on it, whereas historically with that kind
18 of expenditure on OM&A the other two types of reactors
19 have been performing in the 60 to 65 per cent capacity
20 area?

21 A. Well, you are comparing, you know, a
22 few CANDUs with the average of U.S. utilities. Again,
23 as I indicated in my directed evidence yesterday, there
24 are a number of reactors around the world that are
25 operating at the 80/85 per cent level, so...

1 Q. Well, all the CANDU 6s are operating
2 up at the top: the one in Quebec, the one in New
3 Brunswick, the one in Argentina, the one in Korea?

4 A. CANDU 6 performance to date has been
5 very good.

6 Q. Am I drawing a proper conclusion from
7 this evidence, that with equivalent OM&A expenditures
8 the historical record would show or tend to show that
9 the CANDU performs at a higher capacity factor on
10 average than the other two types of reactors?

11 A. Okay. We haven't to my knowledge
12 done that type of analysis because, as I mentioned, you
13 can't simply just change the amount of funding and say
14 that your capacity factor would change by a certain
15 amount.

16 We had to do the retubing, and so there
17 were additional factors that we were faced with during
18 that period that additional funds would not have helped
19 us resolve.

20 [12:15 p.m.]

21 Q. Well, I am curious about page 70 of
22 tab 519 in this regard, in that I see a diverging
23 triangle with respect to expenditures on OM&A from 1991
24 to 2014. One leg of the triangle goes considerably
25 downwards and one goes upwards. Which is the line that

1 Ontario Hydro is going to be following?

2 MR. PENN: A. The line I used in the
3 final overhead in my economic direct evidence, which is
4 page No. 73, it used the upper line of that graph. And
5 I might explain that the upper line increases 1 per
6 cent per annum, and the lower line decreases at a half
7 per cent per annum, and these are the evaluated 80 per
8 cent confidence limits on the expectation of OM&A that
9 was described in Exhibit 43, which is the ONCI report,
10 and that's what we adopted as the best view of the
11 future that we could make today.

12 Q. Is Ontario Hydro allowing for the
13 possibility that OM&A expenditures could go down a half
14 a per cent per year on a year-after-year basis?

15 A. I can only repeat again that for
16 figure 73 which was our best expectation of the total
17 unit energy cost or accounting unit energy cost,
18 whichever term you wish to use for the balance of the
19 planning period was conservatively based on the upper
20 line.

21 Q. Is there any policy or any document
22 that I could look to within Ontario Hydro to say that
23 yes, I could be confident that OM&A expenditures will
24 be at 1991 levels or higher, or is there not?

25 A. Not to my personal knowledge.

1 Q. I want to turn to another subject,
2 Mr. Penn, and that's the contribution that nuclear
3 generation makes to the industry in the Province of
4 Ontario and Ontario Hydro, and there was a study put
5 out by the Premier's Council on this subject.

6 I have again an original copy of this
7 document, Mr. Chairman, I would be happy to leave it
8 with you -- no? It's from the library of AECL but I am
9 going to sacrifice the library, or we will try to get
10 one for you. It is Volume 2 of Competing in the New
11 Global Economy, Report of the Premier's Council,
12 Industry Studies.

13 Are you familiar with that document, Mr.
14 Penn?

15 A. Well, I tried to read it over the
16 weekend. I hadn't seen it previously. Although I was
17 aware of the Premier's Council on this matter.

18 Q. The Premier's Council was put
19 together, as I understand it, to study the various
20 industries in which Ontario should emphasize in order
21 to achieve economic growth and economic expectations.
22 Is that your understanding of what it was put together
23 to do?

24 A. In brief, yes.

25 THE CHAIRMAN: The photocopy is a copy of

1 the whole document?

2 MR. HEINTZMAN: It is not, Mr. Chairman.
3 It is a copy of at least chapter 13, which is nuclear
4 industry, and chapter 15, Ontario Hydro's role in
5 provincial development.

6 THE CHAIRMAN: Now it should have an
7 Exhibit No., is that right?

8 MR. HEINTZMAN: Yes.

9 THE CHAIRMAN: The extract should have.
10 Just a moment, Mr. Poch. .

11 THE REGISTRAR: 538.

12 ---EXHIBIT NO. 538: Competing in the New Global
13 Economy, Report of the Premier's Council
Industry Studies, Volume 2.

14 THE CHAIRMAN: 538.

15 Could you give me the publication date?
16 It doesn't seem to be in here.

17 MR. HEINTZMAN: Yes, I think I can.

18 I am not sure that I can. This is Volume
19 2 that I have in front of me. It looks like 1988, but
20 it doesn't want to tell me.

21 THE CHAIRMAN: A remarkable number of
22 these documents that come in don't have dates on them.
23 I don't know why that is. People seem to be reluctant
24 to put when they are expressing these views.

25 MR. HEINTZMAN: I believe it's 1988. I

1 will have to determine that for you.

2 I think the Board should have a copy of
3 this. It's quite a well-known study. This is the AECL
4 library copy so I think we had better get another copy.

5 THE CHAIRMAN: I thought you were
6 approaching the microphone, Mr. Poch. You weren't, I
7 take it, is that right?

8 MR. D. POCH: No, I was going to express
9 my desire to get a copy. I didn't get a copy of the
10 last couple of exhibits, but my friend happened to have
11 copies of this one, so I can't complain at the moment.

12 MR. HEINTZMAN: Q. I would just like to
13 get your comments on this document, or anybody else who
14 wishes to, Mr. Penn. If you would turn with me to page
15 218.

16 MR. PENN: A. Excuse me, I am having a
17 little difficulty. It's the numbers under the boxes?

18 Q. It's a cute system of numbering.
19 It's on the side under or above a little box, for
20 whatever reason.

21 A. I understand. What is the number
22 again, please?

23 Q. 218.

24 A. Thank you.

25 Q. And in discussing the nuclear

1 industry, the authors say about mid-way through the
2 first full paragraph:

3 Responsibility for the development of
4 CANDU, though resting at the federal
5 level, has been largely influenced by
6 Ontario Hydro. Strategic business
7 decisions such as product
8 standardization, cost reduction and
9 product delivery have not been well
10 planned but rather have evolved over
11 time.

12 Looking at it from your perspective,
13 would you agree with that statement?

14 A. Well, I noted it, in my dressing gown
15 on Sunday morning when I was reading this document, and
16 I thought to myself what a strange comment. And the
17 answer is I wouldn't have said that, but the authors
18 obviously felt it.

19 Q. Why would you say it's strange?

20 A. Well, because from Hydro's point of
21 view and my perspective, I believe that we have planned
22 our nuclear system well, perhaps not as well as we
23 might have done, but this seems to be a criticism that
24 it sort of evolved willy-nilly.

25 Q. Let's drop down the page to the last

1 paragraph on the page prior to the heading Development
2 of a CANDU. It says:

3 Now the future of CANDU is open to
4 speculation with the realization of its
5 untapped potential hanging in the
6 balance, key decisions must be made by
7 both government and industry.

8 Do you agree with that?

9 A. Well, I don't really know what the
10 authors had in mind.

11 Assuming that it was published in 1988
12 and researched in 1987, I assume, then they would have
13 known that Darlington was going to be completed soon
14 and that there was a need, if there was going to be any
15 further nuclear generation in this province of a new
16 variety, for planning. And they would know, I would
17 expect, that the Demand/supply Plan was going to be
18 released sometime in the late 80s.

19 So I can only assume that when they say
20 key decisions must be made by both government and
21 industry, that they are referring to this hearing.

22 Q. Yes. And key decisions must be made
23 by government and industry, that still remains true
24 today.

25 A. For any major project, the key

1 decisions have to be made by industry and government.

2 Q. Yes. And that remains true with
3 respect to the future of CANDU at this time?

4 A. Yes, it does.

5 Q. And then turning to page 219, I was
6 going to read you some of the other portions on this
7 page, but I think we can drop down to just below the
8 No. 219 where it says:

9 While several countries have had small
10 heavy water programs in conjunction with
11 their work on another nuclear systems,
12 Canada is the only advanced
13 industrialized nation that has
14 concentrated its nuclear energy-related
15 R&D almost exclusively on the heavy water
16 reactor. This has permitted a large
17 investment in nuclear power without the
18 need for an expensive fuel cycle or
19 reliance on foreign enrichment an foreign
20 equipment manufacture.

21 That is a correct statement, is it?

22 A. Yes, we have exclusively concentrated
23 on the heavy water system.

24 Q. And I am going to take this as
25 largely read, Mr. Penn, but if I could just take you to

1 page 222. Opposite the number on the side of the page,
2 the authors make the point that Ontario Hydro has
3 avoided the purchase of more than \$7 billion worth of
4 coal since 1971, over 80 per cent which would have had
5 to be imported from the United States. I think you
6 made the same point in your presentation of the Select
7 Committee.

8 That is a correct statement?

9 A. Well, I don't recall whether the
10 avoiding of \$7 billion worth of coal was exactly the
11 same number as I made to the Select Committee, but the
12 sense of it is correct.

13 Q. Yes.

14 A. That is, if we had not built nuclear
15 but had built fossil coal-fired stations, then
16 necessarily, since we don't have any coal in Ontario,
17 we would have imported it either from the United States
18 or Western Canada.

19 Q. On page 224 the authors make a point
20 that I want to discuss with you, under the heading of
21 The Structure of the Nuclear Equipment Industry, the
22 authors say:

23 The Canadian nuclear power equipment
24 manufacturing industry is a high value
25 added, high technology industry shaped

1 largely by its client's AECL and Ontario
2 Hydro.

3 That's a fair statement, is it?

4 A. Yes.

5 Q. And the authors are making the point,
6 I take it, that this is the kind of employment that you
7 should want, that is high value added, high technology
8 type of industry?

9 A. Well, I believe the Premier's Council
10 had asked for advice and information that would assist
11 all industry.

12 I think the full report, if I recall from
13 the index, covers food processing, forestry products,
14 steel manufacturing, auto manufacturing, chemical
15 industry, et cetera, et cetera, telecommunications, and
16 was clearly looking therefore, the Premier's Council
17 was looking for opportunities and, I believe they were
18 looking for from my memory of this study, where best to
19 place priorities in this province to get greatest
20 return and industrial progress.

21 Q. In a high value added industry where
22 you are adding a lot of value in Ontario and a high
23 technology industry, those are the kind of industries
24 that are desirable?

25 A. Well, they are desirable, yes,

1 because often they have spinoffs in other directions.

2 Q. Let's turn to that at page 229 where,
3 in the discussing some of the spinoffs, the authors say
4 about two-thirds of the way down the page:

5 An important spinoff from these
6 private sector nuclear energy R&D
7 investments has been the ability of
8 Canadian companies to compete effectively
9 for export contracts in nuclear and other
10 fields, et cetera.

11 So that one of the advantages of the
12 CANDU program is the spinoff into other nuclear related
13 industries including exports?

14 A. Yes. It's a general statement, of
15 course, but it does give an example of several
16 companies in the export field in nuclear power.

17 Q. I think we can take much of this as
18 read.

19 THE CHAIRMAN: Well, I hesitate to remind
20 you, but this document itself is not evidence itself;
21 it's only used as an ability to cross-examine the
22 witnesses. We are not taking this Premier's Council
23 document in as part of the evidence in this case.

24 MR. HEINTZMAN: Would the Board not look
25 to a document such as this for assistance in...

1 THE CHAIRMAN: I wouldn't expect so, no.
2 I would expect we want to hear what these witnesses
3 have to say.

4 If you want to call the authors of the
5 Premier's Council and put them on the stand, that is
6 fine, but we are not accepting this as evidence.

7 MR. HEINTZMAN: Q. Let's turn then to
8 page 230 for a moment, Mr. Penn. And just about the
9 box on that page the authors say:

10 At the same time one manufacturer
11 indicated that the lack of a clear
12 rationalization plan has frozen his
13 investment plans in such technologies as
14 CAD/CAM and advanced manufacturing
15 systems. There is also some concern that
16 the current restructuring alone will not
17 be sufficient to sustain the industry and
18 protect the manufacturing technology
19 base. It was this concern that prompted
20 Ontario Hydro to launch a security of
21 supply program to protect its \$30 billion
22 investment in existing nuclear plant and
23 facilities. Its secondary objective is
24 to maintain the capability to deliver a
25 new plant. For many manufacturers the

1 time lag between orders has placed them
2 in a restart situation, forcing them to
3 attach a premium to the next order,
4 particularly if it does not form part of
5 a long-term commitment to nuclear
6 equipment.

7 Is that a fair statement of the problem
8 of maintaining a nuclear potential?

9 MR. PENN: A. Well, I believe this
10 particular section or chapter in this report is
11 referring to the fact that with diminishing orders,
12 particularly for export and for fulfilment of orders
13 since Hydro's plants were largely built at that time,
14 that there was some rationalization going on in the
15 industry, and that it notes here Hydro supply
16 division - and I am not familiar with the detail - took
17 an initiative to ensure reliable supply of various
18 materials.

19 Now I am not quite sure whether I have
20 answered your question or not. Maybe you could ask me
21 again if I haven't.

22 Q. As I understand the point that was
23 being made here was that a nuclear program is not
24 something you can turn off and on like a tap. If you
25 could maintain the technology, if you maintain the

1 capacity to deliver a new plan, if you maintain the
2 manufacturer's ability to do so, then that is a
3 desirable thing in terms of a long-term nuclear
4 generation program. Is that a fair statement?

5 A. Well, I think it is a matter of
6 business decisions by the companies involved.

7 I don't think anyone would sustain a
8 business just for the sake of it, only if there was
9 promise of more business in the future.

10 In the case of Hydro, it has an interest
11 of maintaining supply of equipment to keep its current
12 plants operational.

13 Q. But the point I am making to you is
14 that the imposition, for instance, of a moratorium has
15 an impact and a substantial impact on those persons who
16 may be called upon to deliver equipment and whatnot if
17 in 10 or 15 years you decide that you now want to turn
18 the tap back on again; isn't that fair?

19 [12:37 p.m.]

20 A. I think that is a fair statement,
21 yes.

22 Q. Yes. And this point is addressed --
23 not that necessarily, but the policy issue on page 245
24 where the authors say:

25 The fate of CANDU is open to

1 speculation, and the Canadian nuclear
2 industry continues to pose a number of
3 critical choices for Ontario and Canada.
4 These choices revolve around a number of
5 key issues: (1), how to sustain the
6 design and marketing capabilities in a
7 depressed market...et cetera.

8 And dropping down to No. 5:

9 How to use diversification,
10 international project development, and
11 the advancement of Ontario Hydro's
12 programs as vehicles to sustain the
13 domestic nuclear capability.

14 That is a fair way of putting it, is it?

15 A. Well, I think these are
16 considerations that would naturally be made by people
17 in the business, yes.

18 Q. And the next sentence on the next
19 page flows from that:

20 Any decision regarding these choices
21 must recognize the importance of AECL and
22 Ontario Hydro as well as the rest of the
23 nuclear industry in assuring the health
24 of CANDU for the future?

25 That is a fair statement, is it?

1 A. I would just like to see what choices
2 we are regarding, again.

3 Yes, I think it is fair because AECL and
4 Ontario Hydro clearly are the major players in nuclear
5 power in Ontario.

6 Q. And the nuclear industry which
7 supplies much of the equipment?

8 A. Yes.

9 Q. There is a discussion in chapter 15
10 of Ontario Hydro's role in the provincial development,
11 and if you turn to page 301 the authors state that:

12 Ontario Hydro has long recognized that
13 its core business generating and
14 distributing electricity had the
15 potential to generate spinoff business
16 activities. These have fallen roughly
17 into two categories: first, activities
18 such as consulting and training which
19 were a direct result of Hydro's expertise
20 in utility operations and management, and
21 secondly - which is the one I want you to
22 comment on - materials and other
23 by-products of Hydro's electricity
24 generating activities, especially the
25 nuclear operations.

1 Ontario Hydro has long recognized that?

2 A. Yes, it has.

3 Q. And there is then a discussion of
4 what is called NBV, which is the New Business Ventures
5 component of Ontario Hydro, and if you turn with me to
6 page 308 some of the future activities of NBV are set
7 forth, including new markets for Cobalt 60.

8 Somewhere in here it tells us that
9 Ontario Hydro provides something like 60 to 70 per cent
10 of the world's Cobalt 60; is that correct?

11 A. I believe it is 85 per cent.

12 Q. 85 per cent. And what is Cobalt 60
13 used for?

14 A. It is used in treatment of cancer.

15 Q. And tritium for lights and fusion
16 energy is another thing that Ontario Hydro is involved
17 in?

18 A. We are involved currently only in
19 supplying tritium in approved amounts by the government
20 for remote buoys and lights.

21 Q. And another one that interested me
22 was nuclear services and products in the United States.
23 That is another area that these authors were looking to
24 NBV to potentially get involved in; is that fair?

25 A. Yes. We have participated in

1 contracts in the U.S. in assisting some utilities to
2 maintain and rehabilitate their plants.

3 Q. And as we have seen by looking at
4 page 15-53 of the DSP - and you can turn it back up if
5 you wish - that that contribution to the Ontario
6 economy was one of the things discussed in the DSP
7 itself. You will remember looking at it with me this
8 morning?

9 A. Did you say 15-15?

10 Q. 53.

11 A. Oh. Sorry.

12 Q. The highest nuclear case produced the
13 highest contribution to the Ontario economy?

14 A. Well, page 15-53 states -- and I am
15 not knowledgeable to confirm these numbers, but I think
16 it states just below halfway down the page at the
17 middle column that case 22 produces \$95 million more
18 GDP impact and generates 1,100 more personyears of
19 employment annually over the period '89 to 2009.

20 Q. And relative --

21 A. Relative to Case 15.

22 Q. Yes, and if you read the next
23 paragraph, relative to Case 24 -- sorry, relative to
24 Case 15, Case 24 produces \$115 million less GDP?

25 A. Yes.

1 Q. And generates 1,200 less personyears
2 of employment?

3 So knowing that Case 22 is the high
4 nuclear and Case 24 is the high fossil we can see that
5 the high nuclear produces \$210 million more in GDP and
6 2,300 more in employment than the high fossil?

7 A. Yes.

8 Q. And I understand from one of the
9 documents here that - I can't seem to put my hands on
10 it - there are about 30,000 people directly employed in
11 the nuclear industry in Ontario?

12 A. That is correct.

13 Q. And that the industry contributes in
14 excess of \$4 billion annually to the Canadian economy?
15 I have seen that number somewhere, would that be a good
16 number?

17 A. I can't confirm that, I'm sorry.

18 Q. Now, sir, I want to now turn to the
19 question of Darlington, and I am going to give you a
20 handout, and perhaps we can have a look at it over
21 lunch hour, and I will go first then to another
22 document, which I believe is Interrogatory 9.7.160.

23 THE CHAIRMAN: What we do with this
24 document? Does it have an exhibit number?

25 MR. HEINTZMAN: I would like Mr. Campbell

1 to look at it in case he has any problem with it.

2 MR. B. CAMPBELL: It would be helpful,
3 Mr. Chairman, as I understand Ms. Harvie pointed out
4 last week, if we could have these things - rather than
5 having them pop like rabbits out of hats -if we could
6 have them ahead of time, as has been the practice, it
7 would certainly make this a lot easier for our
8 witnesses and ourselves in dealing with these
9 questions.

10 MR. HEINTZMAN: I thought they had been
11 given out, and apparently it wasn't because it had
12 colour codings in it that we weren't able to photocopy,
13 so that is the only reason it wasn't handed out last
14 Thursday.

15 THE CHAIRMAN: Let's give it an exhibit
16 number in any event. Exhibit No.?

17 THE REGISTRAR: Number 539.

18 ---EXHIBIT NO. 539: Letter to K.R. Hedges from
19 J. McCredie dated March 20, 1992 with
attachment.

20 THE CHAIRMAN: Then, you are going to
21 defer any questions about it until after the noonhour?

22 MR. HEINTZMAN: Yes.

23 Q. And why don't I come back to that
24 after lunch because I think it may flow out of, or we
25 can get much of the same information, I believe, from

1 Interrogatory 9.7.160, if we can have a look at that.

2 THE REGISTRAR: What tab number is that,
3 Mr. Heintzman?

4 MS. FINDLAY: Tab 9.

5 THE REGISTRAR: Nine? That will be
6 520.31.

7 ---EXHIBIT NO. 520.31: Tab 9 of Interrogatory 9.7.160.

8 MR. HEINTZMAN: Q. And the point that I
9 want to deal with here is somewhat of an expansion of
10 your evidence concerning the delays at Darlington.

11 I believe that this document gives us a
12 better picture of where those delays have come from
13 than we get necessarily from Exhibit 519.

14 And if we turn Exhibit 520.31 on its side
15 and look at the second page we have an indication of
16 the delays to Darlington set forth across the page
17 referable to each of the Units, 1, 2, 3 and 4, which we
18 could see on the lefthand side; is that correct?

19 MR. PENN: A. Yes.

20 Q. And each of the delays are identified
21 by date and a reason by (a), (b), (c), (d), (e), et
22 cetera, attributed to each of the delays?

23 A. Yes.

24 Q. And then the total net delay is shown
25 in the right-hand column for each of the units?

1 A. Yes. They are shown in months, yes.

2 Q. Yes.

3 A. And they are the addition of the
4 planned scheduled change and the schedule slippage.

5 Q. Yes. Now, if we look at the delay in
6 1979 we are told the delay was (a) and (b), which
7 applies to 1980, a delay due to reduced load growth
8 forecast.

9 My question is, as I understand these
10 delays, they were delays that came by way of
11 instruction from either the Select Committee or the
12 government. Am I correct in that?

13 A. Well, I can't confirm that. I recall
14 during that period that our board of directors made the
15 decision. Whether they received advice or whether they
16 consulted with government, I can't tell you.

17 Q. Well, I have seen a Select Committee
18 report where the Committee recommended that Ontario
19 Hydro stop Darlington for a period of six months. Have
20 you seen that report? I will see if I can put my hands
21 on it over the lunch hour. But are you familiar with
22 that?

23 A. As you can see from this table, there
24 were both advances and delays--

25 Q. Yes?

1 A. --for that sort of period of time,
2 and the delays in '79 and '80, which were significant
3 to the project schedule and its ultimate costs, were
4 due to the decision that it was better to plan to not
5 overbuild with regard to capacity, and that is why the
6 delay was made.

7 THE CHAIRMAN: I don't know whether
8 anything turns on it or not, but my understanding is
9 that ultimately the decision is made by Ontario Hydro.
10 They may receive recommendations from other bodies but
11 that ultimately the decision would be made by Ontario
12 Hydro. I don't know if anything turns on that.

13 MR. HEINTZMAN: That is true, but I would
14 have thought that Ontario Hydro's board of directors
15 being nominated by the Government of Ontario has the
16 ability to carry out its direction.

17 MR. B. CAMPBELL: Well, I'm sorry.

18 THE CHAIRMAN: You are into a real issue
19 there. I think Ontario Hydro's position has always
20 been it is independent of the Government of Ontario.

21 MR. HEINTZMAN: Well, the question was to
22 Mr. Penn whether he is able to confirm or not confirm
23 that those two delays were at the instruction or
24 request of either the government or the Select
25 Committee.

1 THE CHAIRMAN: My point is I don't think
2 it could be on the instruction of the government.
3 There might be recommendations. Whether anything turns
4 on that I don't know. But there couldn't be
5 instructions.

6 MR. HEINTZMAN: Well, I guess
7 "instruction" may be too strong a word.

8 Q. Communication from the government or
9 the Select Committee that the Darlington project should
10 be delayed?

11 MR. PENN: A. Well, I don't have
12 personal knowledge of this subject, Mr. Heintzman,
13 except that the Chairman is quite right, that these
14 decisions are made by the board of directors of Ontario
15 Hydro, and, of course, the chairman, often with the
16 president, consults with the government on a monthly
17 basis. So I don't know any more than that.

18 Q. Well, would it be possible to
19 determine whether those delays were made after
20 consultation or communication from the government?

21 MR. B. CAMPBELL: Well, Mr. Chairman,
22 obviously Mr. Penn is not aware of this interrogatory.
23 There is an interrogatory that deals with this matter.
24 It is 9.24.4.

25 THE CHAIRMAN: Is it in this book?

1 MR. B. CAMPBELL: I will offer no apology
2 for Mr. Penn that he doesn't remember the details of
3 every one of the 1,500 interrogatories on this Panel.

4 MR. HEINTZMAN: I will look at that over
5 the lunch hour. Thank you.

6 MR. B. CAMPBELL: It is very short.

7 MS. PATTERSON: What number was it,
8 again?

9 MR. B. CAMPBELL: 9.24.4.

10 MR. POCH: Perhaps you could read it in
11 because a number of us don't have it.

12 MR. B. CAMPBELL: It is very short, Mr.
13 Chairman, if that would be a convenient way of dealing
14 with it.

15 THE CHAIRMAN: Why don't you read it in.

16 MR. B. CAMPBELL: The question is:

17 Please calculate the costs of
18 Darlington if it had not suffered delays
19 caused by government decision. Please
20 itemize the nature and duration of the
21 delays and the cost of each. Do not
22 treat delays arising from AECB rulings as
23 due to government decisions.

24 Response:

25 Approximately 75 per cent of the

1 delays in the in-service date of the
2 Darlington generation station were
3 planned. They occurred late in '78 and
4 the early '80s. These delays resulted
5 primarily from lower projected demand for
6 electricity and borrowing restraints.

7 While the Ontario Hydro Board approved
8 these planned delays they were discussed
9 with the Ontario government. It is not
10 possible to determine how many months of
11 the delays are directly attributable to
12 government decisions. Therefore, it is
13 not possible to calculate the cost of
14 Darlington if it had not suffered delays
15 caused by government decisions.

16 And then it refers the reader to further information on
17 delays and in-service dates, and it refers them to
18 Interrogatory 9.7.160.

19 MR. HEINTZMAN: I take it, Mr. Campbell,
20 that the communications from the Ontario government to
21 Ontario Hydro has not been produced that are referred
22 to in that interrogatory?

23 MR. B. CAMPBELL: I don't believe so.

24 MR. HEINTZMAN: Might they be produced?

25 MR. B. CAMPBELL: I, Mr. Chairman, am not

1 prepared to undertake to produce or even to inquire as
2 to the nature of those communications.

3 The facts are that the gentlemen on this
4 panel can speak to the matters that arose with respect
5 to Darlington. The essential point is, in my
6 submission, that there is no ability, at least there is
7 no ability for the Ontario government, to direct
8 Ontario Hydro's board of directors to do anything. The
9 board of directors take a look at the circumstances at
10 the time and make a decision.

11 And until legislation, which is currently
12 in front of the Legislature, is passed that is the
13 legal situation, and certainly was at that time.

14 MR. HEINTZMAN: Well, the Ontario
15 government has the ability to direct. Whether anything
16 is done as a result of it is a different question.

17 Now, I am content, if my friend wants the
18 adverse inference to be drawn by not producing any such
19 materials, then that is fine, but otherwise, I would
20 suggest that an interrogatory raised that issue and
21 that is pertinent to an understanding of that --

22 [12:53 p.m.]

23 THE CHAIRMAN: Let's move back a bit.
24 The Darlington construction and bringing into service
25 was delayed, Hydro says, for two reasons: One, plan

1 schedule changes which occurred up to 1986, and
2 schedule slippages since that time.

3 What relevance to our determination of
4 what we have to do is an inquiry into the reasons for
5 and against those decisions being made, which remain on
6 the basis of load forecasting and other reasons that
7 are set out in the document attached to Exhibit 520.31?

8 MR. HEINTZMAN: Well, I would suggest,
9 Mr. Chairman, that a direction by or a request by the
10 government to delay Darlington for political reasons is
11 of a different nature than a decision by Ontario Hydro
12 to defer generation for other reasons. Now that would
13 be my suggestion.

14 THE CHAIRMAN: The reasons are given in
15 this schedule, they are given as being reduced load
16 growth forecast.

17 MR. HEINTZMAN: That's true, but it's
18 impossible to get to the bottom of what is the real
19 reason for that decision unless you have the document
20 that lies behind it.

21 THE CHAIRMAN: But supposing your
22 speculation is right, that there were reasons other
23 than reduced load growth forecast, so what. Why do we
24 need to worry about that in 1992, decisions that were
25 made by a government rightly or wrongly back more than

1 14 years ago.

2 MR. HEINTZMAN: Well, one could say that
3 costs associated with a reduced load forecast that
4 impact upon Darlington are properly included in the
5 cost of Darlington, because we had to do it for that
6 reason. But I would have thought a cost unattributed
7 fairly to that was not, that's one reason. But (B), if
8 you want to look at the Update and determine what the
9 real reason behind the Update is, then this may be of
10 assistance to you.

11 THE CHAIRMAN: Well, the situation at the
12 moment, as I understand it, is that whatever there was,
13 the ultimate responsibility for making those scheduling
14 changes was on Ontario Hydro. They have to accept the
15 full responsibility for that.

16 MR. HEINTZMAN: I don't deny that Ontario
17 Hydro board of directors decided not to proceed with
18 Darlington for a period of 18 months. What I think is
19 relevant to your deliberations is why. And if the real
20 reason is political, then that would be material.

21 THE CHAIRMAN: In what way?

22 MR. HEINTZMAN: For two reasons I
23 suggested, because you could then clearly say this has
24 nothing to do with the cost calculations of Darlington
25 on the first point, and secondly, it would influence

1 you, I would think, in your consideration of the
2 Update.

3 THE CHAIRMAN: Delays for whatever reason
4 have cost implications.

5 MR. HEINTZMAN: That's true, I suppose
6 everything has a cost implication. But a cost
7 implication that arises from a political decision is I
8 would have thought not one that this tribunal would
9 place any weight on.

10 THE CHAIRMAN: I am not sure. I don't
11 quite know why we would or why we wouldn't. It is just
12 a fact that costs did increase and that was why they
13 increased, because of those delays. Whether the delays
14 were right, wrong or otherwise, I am not sure it makes
15 any difference.

16 MR. HEINTZMAN: Well, the request is
17 there, Mr. Chairman, and I think it necessarily -- the
18 interrogatory my friend having referred to having been
19 given and having referred specifically to those
20 matters, he acknowledged the relevance of it and I
21 don't see how he can then say, yes, here is the answer,
22 we can't separate it out, but we won't produce the
23 documents that lie behind it.

24 MR. B. CAMPBELL: Well, Mr. Chairman,
25 with respect we have taken no position that all

1 interrogatory information that we have provided is
2 necessarily relevant. As I have said many times before
3 you, in most cases it's a heck of a lot easier simply
4 to produce a document or answer a short question than
5 it is to be forced to bring motions on the basis that
6 this is or is not relevant.

7 We take no position that all of that
8 information in the interrogatories answer is
9 necessarily relevant or irrelevant. We deal with it as
10 it comes before you, and we have made that clear from
11 the beginning and my understanding is that everybody
12 understood that we were dealing with it on that basis.
13 It is no admission of relevance that we answer an
14 interrogatory.

15 MR. HEINTZMAN: My friend read into it
16 the record.

17 MR. B. CAMPBELL: I was asked to provide
18 information, Mr. Chairman, I did it for convenience.

19 THE CHAIRMAN: It's almost time to break.

20 We are certainly not going to order a
21 blanket order that everything be produced that went
22 into the decision-making process back 15 years ago to
23 delay Darlington. If you want, you can continue your
24 cross-examination to the extent that these witnesses
25 were able to answer the questions. If something comes

1 up of a specific nature which Mr. Penn doesn't know
2 about and we think there ought to be more information
3 provided, we will do that on a specific basis, but not
4 on a general overall basis.

5 We are now adjourned.

6 THE REGISTRAR: Mr. Chairman, with
7 respect, Interrogatory No. 9.24.4, is that to be given
8 a number?

9 THE CHAIRMAN: I think we better give it
10 a number. We spent at least six pages of transcript
11 discussing it, so we better give it a number.

12 THE REGISTRAR: That is 520.32.

13 ---EXHIBIT NO. 520.32: Interrogatory No. 9.24.4.

14 THE CHAIRMAN: Okay. We are adjourned
15 until 2:30.

16 THE REGISTRAR: Please come to order.
17 This hearing will adjourn until 2:30.

18 ---Luncheon recess at 1:05 p.m.

19 ---On resuming at 2:33 p.m.

20 THE REGISTRAR: Please come to order.
21 This hearing is again in session. Be seated, please.

22 THE CHAIRMAN: Mr. Campbell?

23 MR. B. CAMPBELL: Mr. Chairman, there was
24 a document that my friend Mr. Heintzman referred to
25 this morning dated April '91, having today with

1 operating costs. We have made some inquiries, it is
2 based, as I understand it, on EUCG cost data, but this
3 particular document, I gather, the data has been
4 generalized in the way it has been in the rest of the
5 data that you have seen, so we have no objection to
6 this use of document.

7 THE CHAIRMAN: Thank you.

8 Should it be marked?

9 MR. HEINTZMAN: Yes, it may be Mr.
10 Chairman.

11 THE CHAIRMAN: We need it back because we
12 carefully and scrupulously didn't look at it.

13 THE REGISTRAR: A number, Mr. Chairman?

14 THE CHAIRMAN: Yes, please.

15 THE REGISTRAR: Now 540.

16 THE CHAIRMAN: Thank you.

17 MR. HEINTZMAN: It's entitled April 1991,
18 Nuclear Station Operating Costs, Ontario Hydro and the
19 U.S. Nuclear Industry, 1988-1989.

20 ---EXHIBIT NO. 540: Document entitled April 1991,
21 Nuclear Station Operating Costs, Ontario
22 Hydro and the U.S. Nuclear Industry,
1988-1989.

23 MR. HEINTZMAN: Q. Mr. Daly, if we could
24 look to the first inside page dated April 11th, 1991,
25 the chart there summarizes, I believe, the findings of

1 this report comparing, it says on of the left-hand
2 side, how Ontario Hydro's nuclear OM&A costs and staff
3 levels compare to a group of 50 U.S. nuclear stations.

4 If we look on the chart on the right-hand
5 side we see that for 1988 Ontario Hydro's OM&A dollars
6 Canadian per megawatthour is 5.1 compared to these U.S.
7 utilities 16.4.

8 MR. DALY: A. Correct.

9 Q. And in 1989, 6.7 dollars Canadian per
10 megawatthour for Ontario Hydro to \$17 Canadian for
11 these American utilities?

12 A. Yes.

13 Q. And if we can just perhaps look at
14 the Executive Summary for a moment. The summary tells
15 us in the first numbered paragraph about the middle of
16 the page, after stating that it must be considered in
17 light of the many differences between Ontario Hydro and
18 U.S. nuclear utilities, certain conclusions and trends
19 can be exacted, and the first is Ontario Hydro's
20 overall nuclear operating cost and staff levels remain
21 significantly lower than those of U.S. utilities.

22 A. Right. And that, of course, was
23 based on results up to the end of 1989.

24 Q. Yes. And paragraph 4, consistent
25 with past years, U.S. utilities continue to spend more

1 or money than Ontario Hydro on maintenance and support
2 services by a factor of three. The same applies to
3 staffing, only in this case the U.S. utilities outspend
4 Ontario Hydro by a factor of two.

5 That was the finding?

6 A. Right.

7 Q. And then it says in paragraph 5 in
8 trying to explain this, standardization, economy of
9 scale, regulation and technology all play a part in
10 creating these differences. And that's a point made
11 further on in the report, and I would like to come back
12 to that.

13 And in the sixth paragraph it says:

14 Since 1973 in real terms, Ontario
15 Hydro's mean year-over-year cost increase
16 has been 2 per cent per year. This
17 compares with a U.S. experience of about
18 9 per cent per year.

19 And the document then states, rather
20 contrary to the point I am making, hence Ontario Hydro
21 continues to outperform the U.S. on a cost basis with
22 respect to the EUCG group of utilities.

23 A. Right.

24 Q. And if we look at page 3 of the
25 report, we see two charts similar to the ones we saw

1 for 1985 and '86 on the Interrogatory 9.2.73 that we
2 looked at now for 1988 and 1989 showing the costs of
3 Ontario Hydro for OM&A first per kilowatt and then for
4 megawatthour.

5 A. Right. And these are somewhat of an
6 update to the other interrogatory looked at.

7 Q. Right. And if we look at chart 1, we
8 can see that per kilowatt Ontario Hydro's is at 32.4
9 Canadian dollars per kilowatt at opposed to American
10 utilities at about 90.1.

11 So we have a still about a 3 point factor
12 in 1988 and in 1989 41.70 dollars Canadian to 90.3.

13 A. Correct, to the end of '89.

14 Q. Yes, for 1989. And I think we can
15 take the others as read.

16 An interesting comment at the bottom of
17 page 4 on these charts, in referencing to charts 1 and
18 2 we see in the third last sentence:

19 It should also be noted that the EUCG
20 dollar figures presented in charts 1 and
21 2 for 1989 are impacted by the rising
22 value of the Canadian dollar. In fact,
23 the Canadian dollar appreciated by 8
24 percent and 4 per cent in each of 1988
25 and 1989 respectively. This has the

1 effect of depressing the U.S. figures

2 when reported in Canadian dollar terms.

3 And do I understand that to be saying in
4 effect it makes Ontario Hydro look closer to the U.S.
5 utilities than in effect is the case?

6 A. That's my understanding of it.

7 I might also point out at this point in
8 time that the EUCG definition of operating costs is
9 different from the ONCI definition of operating costs,
10 and the EUCG and ONCI costs are not directly
11 comparable. EUCG costs exclude corporate overheads and
12 employee benefits and heavy water upkeep. So our costs
13 are standardized, if you like, to the EUCG definitions
14 but they can't be compared directly with ONCI.

15 Q. Do I understand that has been done in
16 order to prepare this record?

17 A. That's been done in order to prepare
18 this report.

19 Q. That's right.

20 Then on page 8 the document, having shown
21 us a number of other comparisons on pages 6 and 7, of
22 Ontario Hydro to these utilities in the U.S. says:

23 Chart 9 shows that the OM&A unit
24 capacity costs for Ontario Hydro were
25 greater than the U.S. average during the

1 early years of the time frame shown.

2 That's going back to the early years.

3 The general trend has been towards
4 lower resources until recently and at
5 present Ontario Hydro's OM&A unit
6 capacity costs are significantly lower
7 than the average for the U.S. industry.
8 In fact, Ontario Hydro has been at or
9 below the U.S. average since 1978.

10 That is a correct statement and we can
11 get that by again looking at these charts on page 9
12 that we have looked at previously in the interrogatory.

13 A. Yes, and that reflects the situation
14 up to the end of '89.

15 Q. Yes. And does the situation remain
16 the same today?

17 A. As Mr. Penn described, our spending
18 has increased somewhat over the last few years, but as
19 I recall his testimony, we are still at something like
20 50 per cent of the U.S. average.

21 Q. Do you have anymore recent study of
22 this since this one in April of last year?

23 MR. PENN: A. The information given in
24 my direct evidence is up-to-date. And I am referring
25 to page 69 in Exhibit 519, which shows the OM&A costs

1 in dollars per kilowatt 1992 dollars up to the end of
2 last year.

3 Q. Do you have the comparative U.S. or
4 European OM&A costs up-to-date?

5 A. I don't have it with me, no. But
6 there has been a continued upward trend looking at
7 chart 9, in Exhibit 548.

8 Q. Five four what?

9 THE CHAIRMAN: 540.

10 MR. PENN: I'm sorry, 540, the one we are
11 looking at.

12 The open square which is Ontario Hydro,
13 and I am right at the right-hand side of the graph now,
14 continues so that it is about currently at the end of
15 '91, about 50 per cent of that represented by the end
16 of 1991 by the U.S. average which is the closed square
17 in black.

18 MR. HEINTZMAN: Q. Are we talking
19 capacity or energy or --

20 MR. PENN: A. We are talking about
21 Canadian dollars per kilowatt capacity in chart 9.

22 Q. And for chart 10, do you know if it's
23 lower for energy?

24 A. I haven't got the figures for energy
25 with me, but it is somewhat similar. I don't know if

1 Mr. Daly can help me with that.

2 MR. DALY: A. No.

3 Q. And comparing it to say French or
4 Belgium or other countries have which multi-unit
5 approaches, do you know where it stands today?

6 MR. PENN: A. I'm sorry, I don't know
7 that.

8 Q. And if we could look at the last page
9 of that document, Exhibit 540, where again as we saw in
10 the previous interrogatory, the multi-unit effects of
11 OM&A is discussed, and the last paragraph says:

12 The multi-unit effect is one of
13 several factors contributing the apparent
14 relative cost advantage that Ontario
15 Hydro's nuclear division has over the
16 U.S. nuclear industry. Even upon
17 extrapolation of U.S. data to a notional
18 BWR or PWR U.S. cost would still be
19 significantly higher on a normalized
20 basis than Ontario Hydro's cost. Some of
21 the other factors include regulatory
22 environment, utility size and reactor
23 type to name a few.

24 And do I take it from that, that by
25 referring to the reactor type, that's in effect a

1 complement to the CANDU reactor as requiring less
2 maintenance, apparently?

3 A. I can't really comment on that, on
4 the average of the United States units.

5 There are clearly units in the U.S. that
6 are operated by utilities such as Duke Power and
7 Arkansas power that have an excellent record over the
8 years. There are other utilities that don't have the
9 strength of resources and have to rely on outside
10 contracts on maintenance and this sort of thing, but
11 that are considerably poorer. But I can't comment,
12 unless Mr. Daly can, on the average of the U.S. plants.

13 Q. But the authors are trying to explain
14 why Ontario Hydro's OM&A costs are significantly less
15 even allowing for a four unit configuration, and they
16 are saying, well, one of the reasons is reactor type.
17 Are they saying that that's due to the CANDU reactor,
18 Mr. Daly, or if not what are they saying?

19 [2:49 p.m.]

20 MR. DALY: A. I think all I read into
21 that is the differences that the figures show between
22 the CANDU and the PWR and BWR.

23 But, you know, I wouldn't pinpoint
24 maintenance or operations or any one specific aspect.
25 I think they are just saying that, you know, overall

1 there appears to be a difference, and the authors don't
2 go into details, and I'm not familiar with all the
3 details.

4 Q. Charts 17 and 18 show us the
5 continuing difference between Ontario Hydro and the
6 triple unit configuration in the U.S.; is that correct?

7 A. Correct.

8 Q. Let's then go back, if we could, to
9 Exhibit 520.31, which is Interrogatory 9.7.160.

10 THE CHAIRMAN: Tab?

11 MR. HEINTZMAN: It's tab 9 of the volume
12 concerning these materials.

13 Mr. Chairman, before we broke you were
14 indicating that a generalized request for documents
15 underlying these scheduled delays would not be granted,
16 but I am not understanding what a generalized request
17 is. I am only asking for those that lie behind column
18 A and B; that is, 1979 and 1980.

19 THE CHAIRMAN: Perhaps you could find out
20 what these witnesses know about the delays referred to
21 and see what information they can give you about that.

22 MR. HEINTZMAN: Q. Mr. Penn, and through
23 you any member of the panel, do you have any
24 information concerning these delays, and, in
25 particular, whether they were at the request or

1 suggestion of the government or otherwise?

2 MR. PENN: A. Well, as you can see, in
3 columns A and B there were two sets of delays, 18
4 months each in succeeding years, and prior to this
5 period of time, in fact from the mid-70s backwards in
6 time, the growth rate had been as much as 7 per cent
7 per year on average, compounded.

8 It was at about the early to mid-70s that
9 this load growth started declining first to about 5-1/2
10 per cent and then down to 4 per cent.

11 And it is my information, Mr. Heintzman,
12 that given that our forecasting group and System
13 Planning group recognized the reduction in load growth
14 that the matter was brought to our board and our board
15 made the decision on the basis of financial
16 considerations, as I understand it, alone, including
17 borrowing at that time, to delay Darlington project, at
18 least Units 1 and 2 and Units 3 and 4 by even longer
19 periods of time.

20 I do not know what consultation the board
21 had with the government. I'm sorry, I just do not
22 know.

23 Q. Certainly, if we look at column C, an
24 advance that we can read from the footnote on that,
25 that that was a purely political decision; was it not?

1 A. Well, it was part of the build
2 program introduced, I believe, by the, at that time,
3 Conservative government, and it was aimed at reducing
4 unemployment and creating jobs in the trades,
5 principally electrical and pipefitting.

6 Q. So that advance to your knowledge was
7 a political matter, was it not?

8 A. In my knowledge, and I can't be
9 absolutely certain about this, but I believe the
10 government inquired with Ontario Hydro whether we would
11 be prepared to or could accelerate the project, and the
12 decision was yes, we could.

13 Q. And there was a request from the
14 Ontario government to do so?

15 A. As I understand it, yes.

16 Q. Yes. And what you are not aware of
17 at the present moment is whether the first two resulted
18 as a result of a request or inquiry of the Ontario
19 government?

20 A. No, I do not know.

21 MR. HEINTZMAN: So, Mr. Chairman, that is
22 where we sit on that, and I leave my request on the
23 table.

24 THE CHAIRMAN: What do you want to know?

25 MR. HEINTZMAN: I want to know the

1 documentation and discussions that occurred between the
2 Ontario government and Ontario Hydro that led up to
3 those two decisions in 1979 and 1980.

4 THE CHAIRMAN: Mr. Campbell, are you
5 agreeable to that?

6 MR. B. CAMPBELL: Mr. Chairman, Mr. Penn
7 has given his understanding of the main factors of
8 those. He is not aware of any of those, he has been
9 quite forthright about that, and quite frankly, I have
10 considerable difficulty understanding how something
11 that happened that long ago, three governments, three
12 parties ago in terms of governments - older, many
13 governments earlier than that - can possibly be of any
14 assistance to you in facing the decisions and choices
15 and issues that you face today.

16 I just don't understand the relevance of
17 it at all, and I don't think my friend has established
18 that it would be relevant in any respect, and until he
19 does I find myself in the unenviable position of really
20 having nothing to respond to in terms of an argument
21 for request of these documents other than they might be
22 interesting to Mr. Heintzman and his client.

23 I don't think that is an adequate basis
24 for the request, and that is really the only one I have
25 heard.

1 MR. HEINTZMAN: I have said it, and I
2 will say it again: it goes to the question of the true
3 cost of the Darlington station. If the delay was a
4 matter of political choice, then that could very well
5 influence one's view as to the costs of Darlington, and
6 it will similarly impact on other decisions that will
7 impact on choices still before this Board.

8 THE CHAIRMAN: Well, if you want to know
9 what the cost implications were of the delay, that is
10 one thing. I think that may have already been
11 furnished. I am not certain.

12 But what it cost to delay the Darlington
13 project in 1979 by 18 months, 18 in the case of Units 1
14 and 2 and 30 months in the case of 3 and 4, what did
15 that cost, that I think is something that may have been
16 already furnished, if it hasn't been.

17 MR. HEINTZMAN: Well, I am just about to
18 get to that, but my point is: Do all parties before
19 this Board then acknowledge that those costs should be
20 excluded and not considered as a part of Darlington?

21 THE CHAIRMAN: That is argumentative. I
22 think that is a matter that will have to be taken into
23 account when we come to arguing what the appropriate
24 way of looking at costs of nuclear facilities are.

25 MR. HEINTZMAN: Exactly, and that is why

1 in my submission that information is probative so that
2 you can make that decision when you have to make that
3 decision.

4 THE CHAIRMAN: Well, I don't hear Mr.
5 Campbell saying he won't tell you what the cost of that
6 delay was. I haven't heard him say that.

7 MR. B. CAMPBELL: No. Every time I get
8 up and deal with this I end up getting a new request,
9 the request that I am dealing with changes in response
10 to my comments.

11 In fact, I think I directed Mr. Heintzman
12 to two interrogatories or at least to one
13 interrogatory, 9.24.4, where Ontario Hydro has stated
14 in response to that interrogatory that it is not
15 possible to calculate the cost of Darlington if it had
16 not suffered delays.

17 MR. HEINTZMAN: No, due to government
18 interference.

19 MR. B. CAMPBELL: Well, it certainly does
20 not say "due to government interference".

21 MR. HEINTZMAN: Exactly. It does say
22 that. Do you want to read the document, please?

23 MR. B. CAMPBELL: Yes, it says "caused by
24 government decisions". [Laughter]

25 MR. HEINTZMAN: All right. Same thing.

1 THE CHAIRMAN: It is another example of
2 the use of the word "political", I guess.

3 MR. B. CAMPBELL: I would also point out
4 that there is a document - again, I don't know whether
5 my friend has had the opportunity to refer to it - that
6 has been produced in another interrogatory response,
7 which is number --

8 THE CHAIRMAN: Is there any problem or is
9 there a problem with projecting what the cost was of
10 the delay? Is that something that can be deduced from
11 the material?

12 MR. HEINTZMAN: I have no problem with
13 that. I will be going through that with the next
14 document that I gave --

15 THE CHAIRMAN: But what more do you need
16 than that?

17 MR. HEINTZMAN: That that was the result
18 in my friend's language of a political decision.

19 THE CHAIRMAN: All right. Let's assume
20 it was. That is what delays cost, and whether they are
21 political or business or mixed that is what they are.
22 There is no such thing as a pure political decision or
23 a pure business decision, I don't expect. If there is
24 I would like to know what it is in this particular
25 context.

1 MR. HEINTZMAN: If everybody is prepared
2 to proceed in this hearing from now on that that was a
3 political decision, then I am prepared to not ask the
4 document to be produced.

5 THE CHAIRMAN: My remarks weren't
6 intended to make that statement, no. I perhaps didn't
7 express it very well.

8 MR. B. CAMPBELL: Well, in my submission,
9 Mr. Chairman, Mr. Penn has answered the question. He
10 has stated what he understood the causes to be for A
11 and B. He is not able to provide any more.

12 To go for a fishing expedition as to what
13 political considerations may or may not have been
14 extant at the time I do not understand how that can be
15 helpful to the Board.

16 If there is a delay, the consequences of
17 that delay Mr. Penn can speak to and the others to the
18 extent that it comes in their areas can speak to, to
19 the extent that they are able to do so.

20 As I say, I would also point out that we
21 have provided information in another interrogatory;
22 that is, 9.2.113, which is the provincial auditor's
23 report on Darlington costs which was prepared in 1984,
24 and to the extent that the influence of any decisions
25 taken by government are reflected I would expect them

1 to be reflected in that document.

2 But I think the answer that has been
3 given in 9.24.4 is as much as Ontario Hydro can say in
4 the matter, whether that is useful in any respect.

5 In my submission Ontario Hydro ought not
6 to be required to go back and see what communication it
7 received or didn't receive from the government on
8 requesting matters to be considered at that time.

9 The fact of the matter is there was a
10 delay, and, in my submission, the cross-examination
11 should simply proceed on the basis of what the cost of
12 that was.

13 THE CHAIRMAN: Well, Mr. Penn has given
14 evidence that the delay was due to reduced load growth
15 forecasts, which has been given in other times in this
16 hearing, that there was falloff in the demand for
17 electricity in the early 70s or middle 70s and that the
18 reason for postponing the Darlington construction was
19 for that reason.

20 That decision, he said, was made by the
21 Hydro board of directors, and he didn't know to what
22 extent there had been any consultation with the
23 government about it.

24 One could almost infer that there would
25 be some consultation because of the very reasons that

1 there are in No. C. This is going to have some impact
2 on the Ontario economy if you delay a project of that
3 kind.

4 But I think if you have any suggestion or
5 any reason to think that that is not a complete answer,
6 then I think you should perhaps ask some questions
7 directed towards that.

8 If you have got some other reason that
9 you think that was there, rather than just infer that
10 there was some political and almost pejorative sense, I
11 think you should suggest that to him and you can see if
12 there is anything that he knows about that.

13 MR. HEINTZMAN: I am not in a position
14 to --

15 THE CHAIRMAN: You are not in a position
16 to do that.

17 MR. HEINTZMAN: I am not in a position to
18 pursue the matter unless I have the documentation.

19 THE CHAIRMAN: Isn't Mr. Campbell right,
20 that that is just a fishing expedition?

21 MR. HEINTZMAN: No, no. Clearly not.

22 THE CHAIRMAN: Your client must have some
23 knowledge of what went on in those days.

24 MR. HEINTZMAN: Not between Ontario Hydro
25 and the Government of Ontario.

1 THE CHAIRMAN: Well...

2 MR. HEINTZMAN: I am not saying
3 "political" in any wrong sense. I am just saying "a
4 political decision".

5 THE CHAIRMAN: Well, it sounded wrong.
6 It sounds as if there was something wrong about it.

7 MR. HEINTZMAN: No, no. That is what
8 politicians are there to decide presumably, but it
9 doesn't go into the cost of a nuclear generating
10 station.

11 THE CHAIRMAN: Until we get some evidence
12 otherwise I think we have to proceed on the basis that
13 Ontario Hydro has the responsibility for making these
14 decisions. That is what the Statute says.

15 Even in those days there wasn't a
16 memorandum of understanding, I don't think - I think
17 that came later - whereas there has always been, and so
18 it should be, some consultation between the government
19 and Hydro on major matters of this kind. The ultimate
20 responsibility for the decision-making in those days at
21 least was on Ontario Hydro.

22 MR. HEINTZMAN: Well, I will proceed on
23 that basis, Mr. Chairman.

24 Q. Mr. Penn, are you aware of any other
25 generating station of which these kind of delays were

1 planned and placed upon the generating station, these
2 three in 1979, 1980 and 1981?

3 MR. B. CAMPBELL: I'm sorry, are you
4 restricting yourself to Ontario Hydro?

5 MR. HEINTZMAN: Q. Ontario Hydro, yes.
6 I thought that would be --

7 MR. PENN: A. I'm not aware of any other
8 delays of this nature and this size on any of Hydro's
9 nuclear stations.

10 Q. Or advances?

11 A. There were delays, considerable
12 delays on an Atikokan coal-fired station, but not on
13 nuclear that I can recall.

14 Q. And that includes the advances? You
15 are not aware of any advances such as this on any
16 nuclear station?

17 A. Well, subject to checking I can't
18 think of any.

19 Q. There is one other example of a
20 political decision that you are quite familiar with,
21 and that is the nuclear moratorium. You are aware of
22 that?

23 A. Yes.

24 Q. Right.

25 A. Very much so.

1 Q. And you were at the receiving end of
2 that because you were on the CANDU "A" project?

3 A. Yes.

4 Q. And that was a purely political
5 decision so far as you are aware, was it not?

6 A. It --

7 MR. B. CAMPBELL: Well, if by that my
8 friend means it was a decision that was taken by the
9 government, that is fine.

10 I am concerned about just what you
11 raised, Mr. Chairman, that stated that way, like it or
12 not, it has a pejorative connotation. If my friend is
13 simply saying did the government take a decision, then
14 fine.

15 MR. HEINTZMAN: Q. Did the government
16 take a decision?

17 MR. PENN: A. Yes, it did.

18 Q. And there was no other reason for the
19 CANDU "A" project coming to a halt other than the
20 government's decision, was there?

21 A. Not that I know of.

22 Q. And the only thing you can find about
23 the nuclear moratorium is a statement - I don't know if
24 you have ever looked for it - in a Speech from the
25 Throne?

1 A. I heard the Speech from the Throne
2 that day.

3 Q. You heard it?

4 A. Yes.

5 Q. So you were in the House, were you?

6 A. No. We had it televised into Hydro?

7 Q. So the message got through very
8 quickly?

9 A. Yes, it did. Immediately.

10 Q. And there is no Order in Council,
11 there is no -- anything that evidences that being
12 carried into a legal document or effect. Have you ever
13 seen one?

14 A. Well, I can't comment on that. All I
15 can say is that it was not a surprising announcement
16 because the government party had indicated their
17 position for some considerable time prior to that in
18 general terms.

19 Q. So Mr. Campbell then wouldn't object
20 to me using the word "political" attached to that
21 decision then, would he?

22 A. I think you should ask him.

23 [Laughter]

24 MR. B. CAMPBELL: When a party in
25 opposition makes a policy statement it is inevitably

1 political.

2 I would refer, however, my friend to
3 Interrogatory 9.2.115, which has -- that is one
4 place --

5 THE CHAIRMAN: Is that now 9.2...?

6 MR. B. CAMPBELL: 9.2.

7 THE CHAIRMAN: 9.2.115?

8 MR. B. CAMPBELL: That is right.

9 THE CHAIRMAN: Okay.

10 MR. B. CAMPBELL: There is a letter
11 attached to that interrogatory, dated November 16th,
12 1990. That is one place in the record that letter can
13 be found. I know there are others because it has been
14 used on motions of various types throughout these
15 proceedings, which is the government direction to
16 Ontario Hydro with respect to the matters raised in the
17 Throne Speech which spoke to the nuclear moratorium and
18 its --

19 [3:05 p.m.]

20 THE CHAIRMAN: Just a moment. Before we
21 go on, I would like to put 9.2.113 for the next
22 exhibit.

23 MR. HEINTZMAN: Is that 115 or 113?

24 THE CHAIRMAN: We have got two. We
25 missed one on the way through.

1 9.2.113 has got to be recorded.

2 THE REGISTRAR: 520.33.

3 ---EXHIBIT NO. 520.33: Interrogatory No. 9.2.113.

4 THE CHAIRMAN: And then 9.2.115.

5 THE REGISTRAR: Is .34.

6 ---EXHIBIT NO. 520.34: Interrogatory No. 9.2.115.

7 THE CHAIRMAN: Sorry, Mr. Heintzman.

8 MR. HEINTZMAN: Q. And the result of
9 that political decision will have a cost impact because
10 the CANDU "A" project was stopped.

11 MR. PENN: A. It did have a cost impact,
12 yes.

13 Q. It was stopped as effectively as the
14 stop we see under 1979, leaving aside whatever the
15 reason, except now it's been not even 18 months yet,
16 but it's been 16 months so far since that decision.

17 A. As far as I know it's indefinite.

18 Q. So, for whatever reason, Ontario
19 Hydro's nuclear project has been the subject matter of
20 government decision of at least two that we know of,
21 one in 1981 and one in 1990?

22 A. Well, we do know that the nuclear
23 moratorium on new nuclear plant is clearly established
24 and enunciated by the government, yes.

25 Q. And are you aware of any decision by

1 the board of directors of Ontario Hydro to stop the
2 CANDU "A" project or did it just happen by virtue of
3 the letter dated November 16th, 1990 that my friend
4 referred to and I will have to look at?

5 A. Well, I wasn't party to any
6 discussion so I don't know whether the board of
7 directors had prior knowledge before the announcement
8 in The House.

9 Q. Well, are you aware of any decision
10 by Ontario Hydro to stop the CANDU "A" project? Was
11 there a resolution of the board of directors?

12 A. Not that I am aware of, no.

13 Q. Let's talk about another situation at
14 Darlington, and that is -- I think you described them
15 as damage to the fuel bundles. Perhaps you and Mr.
16 Daly had both referred to this problem.

17 A. Yes.

18 Q. And as I understand it, that has been
19 caused by vibrations or pulsations through the piping
20 that leads to equipment adjacent to the fuel bundles
21 that has caused this problem to arise.

22 A. Yes, and initiated by the pumps, we
23 believe.

24 Q. Yes. Now, the Darlington plant was
25 to some considerable extent re-engineered from prior

1 plants; wasn't it?

2 A. Yes.

3 Q. And what I am suggesting to you is
4 that Ontario Hydro has built the plants at Pickering,
5 at 542 megawatts, they built the plants at Bruce at 791
6 originally megawatts, and they built the units at
7 Darlington at 881 megawatts, and on each occasion these
8 plants have been largely re-engineered even though they
9 are standardized as to the individual units in the
10 plants.

11 A. There are detailed engineering
12 differences from plant to plant, yes.

13 Q. And what I suggest to you has
14 happened is that the suggestion of AECL has been to
15 make these as much like cookie cutters, if I can call
16 them that, a CANDU 6 is a CANDU 6. If you turn out a
17 CANDU 6 in Point Lepreau and Argentina and Gentilly 2,
18 and in Korea, you get a high degree of confidence in
19 the elements of the system; don't you?

20 A. Yes.

21 Q. Whereas what has happened here, I
22 suggest, is that the inevitable product of
23 re-engineering; namely, a little glitch turns into a
24 major glitch because there is a vibration from as small
25 a thing as a pump impeller. Is that a fair summary?

1 A. I don't think I follow what you mean
2 by a small glitch turning into a big glitch. We didn't
3 know we had a glitch.

4 Q. Exactly. But you re-engineered,
5 completely, Darlington. You put together a complete
6 engineering package for Darlington?

7 A. There were many aspects of the
8 Darlington design which were based on Bruce B. There
9 were differences for regulatory reasons, there were
10 differences in seismic design, to name just a few. And
11 the heat transport circuit as a matter of interest was
12 a two loop circuit based upon the CANDU 6 design used
13 at Darlington.

14 Q. Yes. But the sizing in piping and
15 everything for Darlington was re-engineered from Bruce
16 or Pickering.

17 A. Well, it was sized according to the
18 output of the plant, so it was appropriate sizing for
19 that purpose. The header size was a function of the
20 number of feeders and the number of channels in the
21 reactor, for example.

22 Q. But you didn't engineer obviously,
23 you didn't engineer into Darlington this problem which
24 has surfaced; namely, that there is a sympathetic
25 vibration somewhere in the plant between the impellers

1 in the pump and the piping in through to the fuel
2 bundles. You didn't engineer that into the plant but
3 it's there.

4 A. No, we certainly didn't engineer it
5 into the plant.

6 Q. But it's there.

7 A. It's there because of a relationship
8 between the number of pulses as Mr. Daly explained, the
9 150 per second or 150 hertz, and the particular length
10 and diameters of the intervening headers and piping
11 that worked together to cause a resultant movement of
12 the fuel bundles in the channel that led to the fuel
13 problem that we have.

14 Q. This is what I understand to be a
15 standard engineer's nightmare; namely, that you
16 engineered unfortunately into the plant a pulsation or
17 vibration that you didn't count on and every engineer
18 tries to avoid.

19 A. We had no reason in the design stage
20 to expect it would happen.

21 Q. But if the plant had been exactly the
22 same to the extent that that's possible as prior
23 plants, then this problem wouldn't occur, would it?

24 A. If it had been exactly the same
25 circuit as Bruce "B" it would not have occurred.

1 Q. And if you had produced plant after
2 plant of exactly standardized construction, then you
3 would not have in a subsequent plant a problem that
4 didn't exist in the prior plant; would you?

5 A. Maybe not. Maybe you would have had
6 other problems, but it's speculative.

7 Q. That's the whole idea in these plants
8 is to keep perfecting one design rather than changing
9 from 791 to 881 to 561. Isn't that the whole theory
10 behind the CANDU 6 program, that you stay with a
11 standard design?

12 A. I think it is an excellent idea. In
13 fact, I advocated it in ONCI. I spoke at length on the
14 importance of standardization and what Hydro had done
15 in designing two sets of standardized series of 8 and
16 12 units in each of them. So we are very, very much
17 aware of this issue.

18 Q. And to the extent that Darlington
19 departs from Bruce, that problem was created which
20 wouldn't have been created if it had been exactly the
21 same as a predecessor design, to the extent that's
22 possible; correct?

23 A. Yes. At the time it was considered
24 that a two loop circuit would show improvements in the
25 long-term over a one loop circuit.

1 At one time we were considering three and
2 four loop circuits for larger and larger sizes of
3 units. This type of approach is universal throughout
4 the world in the developed countries in designing the
5 primary heat transport systems. There is nothing
6 unconventional about what Hydro did at Darlington.

7 Q. I am not suggesting there is, but I
8 do suggest that Ontario Hydro has re-engineered these
9 plants continually and as a result of that has a very
10 large engineering department which would not be
11 necessary if you either had standard units that were
12 the same each time; is that not fair?

13 A. If we built over and over again the
14 same unit, we could certainly have less designers.

15 Q. Yes.

16 A. But the size of the design
17 engineering department in Hydro are not associated with
18 alone or necessarily with the conceptual or basic
19 design of the plant. It's connected with project
20 management of the design and the construction and many
21 other things.

22 Q. One of the criticisms that some of
23 the intervenors have made against Ontario Hydro is that
24 it has a huge engineering document. It doesn't
25 contract out its engineering as Hydro Quebec does.

1 That is a standard criticism I have heard made of
2 Ontario Hydro. You have heard that, I take it.

3 A. I haven't heard it personally in
4 recent times. But Hydro does contract out
5 hydroelectric and fossil generating work, and has had
6 that by policy for some considerable number of years.

7 Q. Well, I noticed it in your report to
8 ONCI, that Ontario Hydro has a policy of having its own
9 internal engineering department, and this
10 differentiates you from Hydro Quebec which contracts
11 with a Montreal Engineer and Lavallin and outside
12 engineering companies to do the engineering.

13 A. Well, Hydro Quebec, 95 or -6 per cent
14 Hydro's Quebec's capacity is hydroelectric.

15 Q. Well, this is not the point I am
16 seeking to make.

17 The point I am seeking to make is that
18 the re-engineering that went into Darlington resulted
19 in a design defect occurring which would not have
20 occurred had it been a cookie cutter attitude or
21 approach to development of generating plant after
22 generating plant after generating plant; is that fair?

23 A. There are many areas of all our
24 plants that have been standardized. We use proven
25 equipment over and over again in concepts.

1 You are quite right that we did make a
2 change in the primary heat transport circuit when we
3 moved from Bruce "B" to Darlington, but I don't
4 consider that or should I describe it as re-engineering
5 the plant.

6 Q. Fine. The French have been very
7 intent upon producing a nuclear generating station as
8 close as possible in design to the previous one as they
9 can; is that not fair to say?

10 A. Yes. And they had three series of
11 designs as opposed to Hydro having two series of
12 designs, and they are now launching a fourth series of
13 design.

14 Q. But they are very, very similar in
15 terms of their design configuration, are they not?

16 A. Well, they are a different size of
17 plant, but conceptually they are quite similar.

18 Q. And can you tell me when Electricite
19 du France is going to be bringing on their next units,
20 or do you know?

21 A. They don't plan to, as I understand
22 it, to order for in-service anymore than the five units
23 that they have got under construction at the moment.

24 Q. They have five units under
25 construction?

1 A. Yes.

2 Q. And when were they going to be coming
3 on stream?

4 A. I would be guessing, but I think it
5 is between about 1995 and the year 2000.

6 Q. Now, sir, I want to turn - and
7 perhaps Mr. Daly can help us on this as well - to
8 another subject, and that is -- sorry, before we go
9 there. I did hand to you a document -- did we mark it
10 as Exhibit 539, Mr. Chairman? It was a letter from
11 Ontario Hydro to Mr. Hedges with an attached history
12 summary of Darlington generating station. 539?

13 THE CHAIRMAN: Yes.

14 THE REGISTRAR: That's correct.

15 MR. HEINTZMAN: Q. I believe the
16 attachment is all or part of a handout which is
17 available from Ontario Hydro concerning the events at
18 Darlington.

19 Are you familiar with this attachment,
20 Mr. Penn?

21 MR. PENN: A. Yes, I am.

22 Q. And it really tells us much that we
23 have already looked at in the Exhibit 520.31, which is
24 the analysis of the delays and advancements, and I
25 don't want to go into it in detail, but the first

1 sentence basically speaks to the point that we are
2 concerned with here. This is the first sentence of the
3 attachment which says:

4 Darlington has presently estimated the
5 cost 13.8 billion when completed in 1993.
6 This includes about 5.8 billion or 42 per
7 cent in interest charges.

8 That's the present situation?

9 A. Yes, it is.

10 Q. And if we look on page 2, on the
11 third bullet, which we will come to:

12 Appendices 3 and 4 show the changes in
13 the project cost estimate over the years
14 and escalated in constant dollars
15 respectively since the definition
16 estimate in 1991. The most significant
17 single cost increase was in 1983 when the
18 project cost estimate rose by 3.37
19 billion due to the imposed two-year
20 deferral of Units 3 and 4, corporate
21 financial policy changes and worsening
22 economic conditions.

23 Appendices 5-1 and 2 together
24 summarize the major factors contributing
25 to the overall cost increase of 6.4

1 billion since 1991. Approximately 70 per
2 cent of this interest is primarily
3 interest associated with scheduled delays
4 and financial policy changes with the
5 balance representing scope changes mainly
6 due to more stringent regulatory
7 requirements, and estimate changes
8 resulting from the complexity of the
9 project.

10 If you can turn with me to the fourth
11 last page, we can see the various components of
12 Darlington, it's called appendix 3 at the top.

13 A. Yes, I have it.

14 Q. And we have blue for D&C branch.
15 What is D&C branch?

16 A. Design and construction.

17 Q. And yellow for production branch,
18 what is that?

19 A. That's the branch that operates the
20 nuclear hydroelectric and fossil generating stations.

21 So the costs there are associated with
22 commissioning the plant and training the staff and
23 other OM&A and capital issues that I described in my
24 direct evidence.

25 Q. Right. And then we have got in

1 black, the interest expense which we can see has risen
2 substantially from the 1981 estimate and the final
3 picture in 1992.

4 A. Yes.

5 Q. And if we look at the second last
6 page appendix 5(i), we see that in more graphic form
7 where we are looking at the historical cost increases,
8 51 per cent of which is due to schedule changes; right?

9 A. Yes. Well, an update of the
10 interrogatory, I think it was 9.7.160, is provided on
11 appendix 2 of the document that we are now looking at,
12 and the schedule changes that were planned amounted to
13 three years for Unit 1, three years for Unit 2, 4-1/2
14 years for Unit 3 and 4-1/2 years for Unit 4.

15 Those are the sums of the delays and
16 advances that are in the left-hand side of the chart
17 that's called Plan Schedule Change, and that in turn
18 translated into a cost to the project because of
19 delayed in-service of \$3.3 billion in 1990, in actual
20 dollars of the year.

21 Q. So that what we have in appendix 2 is
22 an update of what we had on Exhibit 520.31, which is
23 the interrogatory.

24 [3:28 p.m.]

25 A. Oh, fine. Thank you.

1 Q. Yes. All right. Now, can we then
2 turn to the subject matter of pressure tubes, and I
3 just wanted to --

4 THE CHAIRMAN: Pressure tubes, perhaps
5 we --

6 MR. HEINTZMAN: This is a good time.
7 Thank you, Mr. Chairman.

8 THE CHAIRMAN: Just before you go, we
9 have now issued a decision following the discussion of
10 March the 10th and 11th, and copies of that are
11 available in your mailboxes. That saves the trouble of
12 writing it out. Any party that doesn't have a mailbox
13 we can provide copies to them through the usual
14 channels.

15 We will now adjourn for fifteen minutes.

16 THE REGISTRAR: This hearing will take a
17 15-minute recess.

18 ---Recess at 3:29 p.m.

19 ---On resuming at 3:47 p.m.

20 THE REGISTRAR: Please come to order.
21 This hearing is again in session. Be seated, please.

22 MR. HEINTZMAN: Q. Mr. Penn and Mr.
23 Daly, these questions I think will primarily concern
24 you, and we are talking about retubing, and you
25 provided to us in Exhibit 519 at page 63 some details

1 with respect to the performance in retubing that
2 Ontario Hydro has experienced with respect to
3 Pickering 1 and 4 which are either now history or in
4 the course of being completed.

5 I would just like to supplement that and
6 try to understand the progress that Ontario Hydro has
7 made, and the first document that I wanted to refer to
8 which I believe you have, and if Ms. Findlay could
9 deliver it to the Board, it is entitled, so you can put
10 your hands on it Proceedings of the Sixth KAIFKNS
11 Annual Conference, April 15th to 17th, 1991, Seoul,
12 Korea, a paper entitled CANDU Retubing: A Review of
13 Ontario Hydro's Current Experience and Future
14 Improvements, by J.O.N. Allen, if that could be marked
15 as an exhibit, Mr. Chairman.

16 THE REGISTRAR: 541.

17 THE CHAIRMAN: Thank you.

18 ---EXHIBIT NO. 541: Proceedings of the Sixth KAIFKNS
19 Annual Conference, April 15th to 17th,
20 1991, Seoul, Korea, a paper entitled
21 Candu Retubing: A Review of Ontario
22 Hydro's Current Experience and Future
23 Improvements, by J.O.N. Allen.

24 MR. HEINTZMAN: Q. And this is an
25 article by Mr. Allen of Ontario Hydro concerning this
issue, is it?

MR. PENN: A. Yes, it is.

1 Q. Or a presentation by him? And what I
2 want to do is assist the Board in understanding the
3 elements of retubing that Ontario Hydro has succeeded
4 in shortening, and if you would turn to page 272 can we
5 see there in figure 2 the various ingredients of a
6 retubing project in various greys or whites or blacks
7 for each of P1, P2, P3 and P4 of Pickering? That's
8 what we are seeing there, is it?

9 A. Yes, it is. Just to be helpful, they
10 are in calendar order. In other words, unit
11 preparation is the first activity, followed by vault
12 preparation, et cetera.

13 Q. Followed by F...

14 A. Followed by fuel channel removal, a
15 process of removing the channels; then, inspection of
16 the channel assemblies themselves; then followed by
17 fuel channel installation; and then restarting the
18 reactor following recommissioning of it; and then
19 declaration of in-service, given that the plant
20 performs at 100 per cent power for the equivalent
21 of...I believe it is about in this case a month or so.

22 Q. Yes. And the order in which these
23 retubings proceeded, as I understand it, was first P2,
24 then P1, then P3 and then P4?

25 A. That's correct.

1 Q. So just by looking at the upper
2 figure, figure 2, we can see that as your page 63 shows
3 the time for each of the retubings has got
4 progressively smaller and smaller?

5 A. Yes, it has. And I also showed that
6 on page 63 of Exhibit 519.

7 Q. Yes. That's right. And the point I
8 want you to comment upon and confirm is that we can see
9 that the various elements in the retubing have
10 themselves with some exceptions got shorter and shorter
11 when we compare the lengths of the bars in P2 to the
12 lengths of the bars in P1 and then P3 and then P4, we
13 can see that each of the elements of the system are
14 getting faster and faster in terms of completing them?

15 A. It is my understanding that all
16 activities have been reduced as we have proceeded from
17 P2 to P1 to P3 to P4.

18 Q. And the other part of this that I
19 wanted to have you comment upon is the figure 3, which
20 again shows, perhaps with less progression, that the
21 dose uptake is to some extent decreasing, although that
22 is not so clear on P4. Can you comment upon that chart
23 and what we are seeing there?

24 A. I would like to start by commenting
25 that before we had ever retubed a reactor we thought

1 that the dosage may amount to as much as 2,000 rem.
2 Maybe Dr. Whillans would like to comment on some of
3 these figures in a moment.

4 In fact, - and I am more used to rem than
5 millisieverts - we retubed Pickering 2 for something
6 less than 400 rem, and, indeed, the rem for Pickering 1
7 was about 300 rem.

8 Q. And the figure 3.45, 3.04, 4.216, and
9 2.95, are those the numbers to which you are referring?

10 A. Well, those are the dosage in
11 thousandths of millisieverts. The reason, I believe,
12 for the increase in Pickering 3 was related to the
13 additional activities that we did in order to reduce
14 the length of time of the outage.

15 DR. CONNELL: Excuse me. All the fuel
16 was removed, I take it, before the retubing?

17 MR. PENN: Yes, Dr. Connell. During the
18 process of unit preparation, that is the first
19 activity. The first thing we would do is remove the
20 fuel totally from the reactor.

21 DR. CONNELL: And that is done by the
22 usual fueling and defueling so there is no exposure
23 during that phase of it?

24 MR. PENN: That is quite correct.

25 The next thing we do is remove the heavy

1 water from the coolant system and from the moderator,
2 and then we use a process which is called CanDecom to
3 decontaminate the reactor face to reduce the fields to
4 levels where workers behind special shielding doors can
5 safely operate. So that is all part of preparing the
6 unit for retubing.

7 MR. HEINTZMAN: Q. Yes. Okay. With
8 that background I want to then turn to the letter to
9 Mr. Lockerby, dated March 19th, 1992, which gives us
10 some further analysis of these improved performances.

11 If that can be marked as the next
12 exhibit?

13 THE REGISTRAR: 542.

14 ---EXHIBIT NO. 542: Letter to Mr. Lockerby, dated
15 March 19th, 1992.

16 MR. HEINTZMAN: Q. And in Mr. Mark's
17 letter of March the 19th, 1992 he says in the second
18 paragraph: The aim was to retube P3 within a 23-month
19 outage (accomplished in 26 months) and P4 in a 19-month
20 period. On P4 we are currently six months into the
21 outage and 24 days ahead of the schedule.

22 So those schedules on the best and most
23 current information are being met or exceeded so far as
24 P4 is concerned?

25 MR. PENN: A. Yes, indeed. If I may

1 comment that while it took 26 months for Pickering 3
2 that time was not entirely due to the pressure tube.
3 We had some difficulties with the turbine generator at
4 restart that extended the period from that 24 months to
5 26 months.

6 Q. And on the next page Mr. Mark has
7 shown us in bar chart form the elements similar to what
8 we saw before but with slightly different descriptions
9 on each of them, starting with F2, feeder disconnect,
10 through to F26, and you will see the black represents
11 the P3 actual time for that particular stage, the
12 slanted hatched line is the P4 scheduled, and the
13 square hatched are the P4 actual times for each of
14 these components.

15 And again, the P4, both scheduled and
16 actuals, are considerably less than the P3 actuals for
17 each of the elements of the retubing exercise?

18 A. That is correct. What we are looking
19 at here is the various parts of the removal of the
20 pressure tubes starting with disconnecting the feeders
21 that go into the headers from the channels themselves,
22 right through to deburring, engaging, and cleaning the
23 bellows, and checking the annular gas system before we
24 start with the replacement phase of the campaign.

25 Q. Right. And in each case except the

1 first F2 the actual times taken for Pickering Unit 4
2 have been less, in some cases substantially less, than
3 the scheduled times?

4 A. That is correct.

5 Q. And the other chart that I thought
6 was of interest to the Board is the retubing doses
7 chart, which is the last page.

8 Again, what we have charted here is the
9 P3 actual dosages for each of these stages in black,
10 and then the P4 series actual in cross-hatched, and
11 then a cumulative total so you could follow it across
12 if you wished to by the stars connected with the
13 various lines and the P4 cumulative actual in the
14 square boxes across the page so that we can see that
15 the P4 actual doses are very considerably less in some
16 cases and in all cases less than the P3?

17 A. Yes, and the cumulative is about half
18 or less than half.

19 Q. So that the --

20 A. Just so that everyone understands
21 what this graph is showing, when Mr. Mark says man-rem
22 per series as being the left-hand vertical axis what he
23 is talking about with the word "series" is each of
24 these activities that I previously mentioned.

25 Q. And on the right-hand side the

1 man-rem cumulative?

2 A. Of having carried out each of these
3 series of events or activities as I have described
4 them.

5 Q. The F2 to F26 activities?

6 A. Yes.

7 Q. So that both in terms of time and in
8 terms of dosages the performance in retubing has very
9 considerably improved into the fourth unit at
10 Pickering?

11 A. Yes, it has.

12 Q. And I take it Ontario Hydro has every
13 expectation that that kind of performance can be
14 maintained in the future?

15 A. We believe it can, yes.

16 Q. Now, I want to turn from that concept
17 to a related one, and if you could turn to the
18 thirteenth tab of the interrogatories to Interrogatory
19 9.9.15.

20 THE REGISTRAR: That is .35.

21 ---EXHIBIT NO. 520.35: Interrogatory No. 9.9.15.

22 MR. HEINTZMAN: Q. And this
23 interrogatory deals with or attaches a presentation
24 made by three individuals, I believe from Ontario
25 Hydro, Mr. Chada, Mr. Andreeff, and Mr. Rolfe, entitled

1 Canadian Programs for Understanding and Managing
2 Nuclear Power Plants' Aging Degradation; is that
3 correct?

4 MR. DALY: A. That is correct.

5 Q. And it basically sets forth, if we
6 read the abstract dealing with aging of nuclear power
7 plants, similar to what we have already heard in other
8 panels concerning fossil plants?

9 A. Okay. I am not familiar with what
10 you heard from fossil.

11 Q. But this deals generally with
12 managing nuclear plants as they become older?

13 A. Correct. The program has two
14 objectives: one, to assure that we get the 40-year
15 life; and second, to maintain the option of extension
16 beyond that.

17 Q. Yes. And that is the point I want to
18 take us to on the second page of this document, not
19 numbered but it is on the back of the first of this
20 presentation.

21 It refers to the Nuclear Plant Life
22 Assurance Program, that the main objectives of the
23 program are:

24 One, to maintain the long-term
25 reliability, availability and safety of

1 Ontario Hydro's nuclear plants during the
2 nominal service life of 40 years (life
3 assurance); and two, to preserve the
4 option of extending the life of Ontario
5 Hydro's nuclear plants beyond the nominal
6 service lives of 40 years (life
7 extension).

8 That is the object of that plan or
9 program?

10 A. Yes, these are the objectives of the
11 program.

12 Q. And it continues on the next page:

13 The program focuses on understanding
14 and managing aging degradation of a
15 relatively few major components that are
16 most critical to the long-term
17 reliability, safety and life of the
18 plants since they cannot be easily and
19 economically replaced.

20 And then in the paragraph after that:

21 The methodology used was based on
22 accepted international practice.

23 So do I take it that this idea of
24 managing plants as they become older is something that
25 is recognized in international practice?

1 A. It is recognized, and most countries
2 who have plants of this sort of age are engaged in
3 similar types of programs.

4 Q. I suggest to you that managing and
5 life extending a nuclear generating station makes even
6 more sense than doing so with respect to a fossil
7 generating station.

8 I will give you some reasons why, as I
9 understand from the literature, that is so.

10 First of all, the fuel component of a
11 nuclear station is much less than of a fossil station,
12 and therefore, there is every reason to make sure that
13 you can extend the life of a nuclear station as opposed
14 to a fossil station which has a much higher fuel
15 component in its cost?

16 [4:07 p.m.]

17 A. I am not qualified to speak on fossil
18 life extension.

19 I think, and obviously we believe, that
20 life extension is -- there is potential for nuclear,
21 and hence we begun this project, and we are certainly
22 interested in the work that the fossil people have been
23 doing, but I am not in a position to make comparisons
24 as to whether one is more useful or more beneficial
25 than the other.

1 Q. Certainly you must be in tune with
2 the technology and the new concepts of life extension
3 in more than the nuclear generating system.

4 A. Personally, no. No, I pretty well
5 concentrate on the nuclear side myself.

6 Q. Are there others within Hydro who are
7 familiar with life extension of nuclear stations other
8 than yourself?

9 A. Oh, yes, there are several people in
10 operations and design who are involved in the various
11 aspects of this particular program, and also as I
12 mention in this interrogatory the work done on the
13 Bruce "A" rehabilitation and the Pickering
14 rehabilitation all supports the plant life assurance
15 objectives, so that involves a large number of people.

16 Q. Do I take it then that you are not
17 directly involved in this program?

18 A. Yes, I have participated in this
19 program. What I was saying is I haven't participated
20 or had any involvement in the fossil life extension.

21 Q. But you are involved in the program
22 to study the extension of lives and to keep open the
23 viability of extending the live of nuclear generating
24 stations?

25 A. Yes, I have participated in this

1 program, yes.

2 Q. And that is an ongoing proposition
3 and possibility?

4 A. It is.

5 Q. Yes. And from a common sense
6 standpoint, is it not the case that when you have got a
7 station which relies on a fuel which is much less
8 expensive than the fuel for another station, life
9 extension makes that much more sense for the low cost
10 fuel station?

11 A. Again, there is technical issues and
12 there is economic issues, there is a whole variety of
13 issues. It certainly makes sense to look at it in
14 nuclear, it certainly make sense to look at it in
15 fossil.

16 Q. All right. Now, the second one that
17 I understand makes sense to life extend nuclear is
18 because nuclear is highly controlled by a regulatory
19 agency, either in Ontario or elsewhere, and therefore
20 has to operate at what I will call as close to new as
21 possible, as opposed to something like fossil which
22 does not have the same regulatory environment. Would
23 you comment on that?

24 A. I can't comment on the fossil
25 regulatory situation.

1 Q. But again, comparing it to nuclear
2 you have a very tight regulatory environment for
3 nuclear which makes you keep your generating stations,
4 I will use of the expression, as close to new as
5 possible to meet that kind of regulatory environment.

6 A. We are certainly tightly controlled
7 and we do make certain backfits, but the degree and
8 amount of those vary from station to station.

9 Q. All right. Then the third reason I
10 suggest to you that it makes sense for a nuclear
11 station is that for a life extension of a nuclear
12 station you don't have to put on all of the
13 environmental equipment which we heard so much about,
14 when you were not here in Panel 9, to life extend the
15 fossil stations. If you are going to life extend the
16 nuclear station, you don't have to put on all sorts of
17 environmental equipment; do you?

18 A. We have not completed our nuclear
19 plant life assurance studies. As this document
20 describes, we are in the process of looking at it and
21 what results at the end of that process we are not in a
22 position to definitively say yet.

23 Q. When do you expect that to be
24 produced?

25 A. We have been scoping this for three

1 or four years. Much of the work or some of the work
2 was undertaken during the Pickering retubing and some
3 will be undertaken during the Bruce retubing. So it's
4 an ongoing process through much of the 90s. As we say,
5 we have not made any commitments to life extend at this
6 point in time and we are not in a position to.

7 Q. So you have been looking at this
8 subject for two or three years?

9 A. About four, about four years
10 seriously yes.

11 Q. Four years seriously looking at life
12 extending nuclear stations?

13 A. Yes.

14 Q. Now, do you know how long Ontario
15 Hydro has been seriously looking at life extending
16 fossil stations?

17 A. No, I don't.

18 MR. PENN: A. I think I would like to
19 correct something.

20 We have not been looking for four years
21 at extending the life of nuclear stations. We have
22 been looking for four years at the nature of the
23 condition of the plants so that we will be in a
24 position to assess life extension.

25 Q. But if the board of directors of

1 Ontario Hydro had come along to you and said, Mr. Daly,
2 we want you to do a crash analysis of what it would
3 take to life extend the nuclear stations, I take it you
4 could have done that.

5 MR. DALY: A. I wouldn't put much value
6 on a crash analysis.

7 THE CHAIRMAN: To what extent is the
8 circumstance there has been, as far as I know, no
9 nuclear station that's gone through a 40-year period
10 yet anywhere in the world, to what extent does that
11 effect?

12 MR. PENN: It's a considerable effect,
13 Mr. Chairman.

14 Our experience only extends to 20 years
15 the we don't feel at this point in time that we are in
16 a good position to extend the life of our plants which
17 is currently 40 years.

18 In the United States there are plants
19 that are more than 30 years old, and under a regulatory
20 regulation licence of the United States Nuclear
21 Regulatory Commission there is a process that involves
22 not only submission of documents by the utility to show
23 why it is appropriate and safe to extend the life of
24 nuclear plant, but that subsequently goes to a public
25 hearing to make that decision, and that process is now

1 under way in the United States but has only recently
2 been instituted.

3 MR. HEINTZMAN: Q. So in respect of
4 nuclear in the United States, there is a considerable
5 body of information being developed now through public
6 hearings and regulatory processes?

7 MR. PENN: A. There will be. The
8 utility in question, which is in the northwest, is
9 preparing the documents to apply to the USNRC for their
10 review. There would subsequently be a public hearing.

11 Q. Is that the first --

12 A. So there is a period of nearly 10
13 years that the utility has before its 40-year life
14 expires in order to gain approvals to do a life
15 extension.

16 Q. Is that the first application for
17 life extension in the U.S. that you are aware of?

18 A. Yes.

19 Q. And which utility is that?

20 A. I think it is Northwest Utility.

21 MR. DALY: A. It's the Monticello.

22 MR. PENN: A. Monticello. It's out of
23 Minneapolis, I believe.

24 Q. And do you know when that is
25 anticipated to be dealt with?

1 A. I would be guessing, I am just
2 reflecting on information that I got when we visited
3 the Electric Power Research Institute only a few months
4 ago, I think it probably is going to take at least
5 three or four years before the USNRC has fully
6 evaluated the documents it's being provided and knows
7 whether there is due reason to consider the matter with
8 seriousness.

9 Q. I take it that there is no similar
10 process for fossil generation to go through the United
11 States to life extend?

12 A. I don't know whether there is or is
13 not.

14 Q. In any event, if Ontario Hydro had
15 asked you to prepare an analysis - I won't use the word
16 crash - of the extension of the nuclear stations, I
17 take it that could have been done?

18 MR. DALY: A. This analyses program is
19 already under way and part of it is described here.

20 It's primary goal is getting the 40
21 years, the secondary goal is extension. But the
22 primarily goal for the present time has focused on,
23 let's make sure we get the 40 years.

24 So the analysis and so on that you are
25 talking about is under way and some of the activities

1 have been implemented on Pickering and some will be
2 implemented shortly on Bruce.

3 Q. But if you were asked, can you give
4 me any sort of time frame for the preparation of a
5 report that would give us the best possible opinion on
6 whether the extension of life of nuclear generating
7 stations was a feasible proposition, if you were asked
8 to do so with the appropriate team of Ontario Hydro
9 personnel?

10 MR. PENN: A. We don't consider at the
11 present moment that we have enough operating
12 information from our nuclear program to be able to
13 reach the conclusion. We are still gathering
14 information.

15 So, the answer to your question is that
16 if a study were done, it is my judgment at this time
17 that we would say to you, there are a number of areas
18 where we don't have enough information yet and we need
19 certain number of years of experience in order to get
20 it before we can make that judgment.

21 Q. At what point in time does this
22 become something we can use? Do we have to get the 39
23 years? At what point do we -- I read this document as
24 telling us that Ontario Hydro has a plan to preserve
25 the option of extending the life, and I therefore

1 assumed that in progress was a plan to study this and
2 have it available as an option, not in the 39th year
3 but now?

4 A. We will probably know within this
5 decade.

6 Q. Within this decade?

7 A. Yes.

8 Q. All right. And we have Pickering's
9 first station due to come off in?

10 A. The first unit is 2011.

11 Q. 2011. So that at least 10 years
12 before that you would expect there to be an ability to
13 make that kind of a decision as to whether it should be
14 extended or not?

15 A. It will be my judgment that that
16 would be the case, yes.

17 MR. DALY: A. If I might just add one
18 point there, when we were talking with EPRI about
19 Monticello, they indicated that the decision there
20 would be made sometime between year 20 and year 35,
21 within that time frame, which for Pickering -- well,
22 let's say Pickering would be between '91 and 2006.

23 Q. But, as far as I can determine at
24 this point, no attempt has been made from the
25 documentation I have seen to look at extension of the

1 nuclear generating stations as the appropriate way to
2 go rather than extending the fossil stations. Are you
3 aware of any such analysis for the purposes of the
4 Update or otherwise.

5 MR. PENN: A. I don't know if I
6 understand the question. Could you repeat it, please?

7 Q. Yes. I would like to know whether
8 any study has been done within the limits that's
9 presently possible to determine whether the option of
10 extending the nuclear stations is the appropriate thing
11 to do instead of some other generating alternative such
12 as extending the fossil stations?

13 MR. B. CAMPBELL: With respect, Mr.
14 Chairman, hasn't the witness already answered this
15 question? He said in his judgment, in his professional
16 opinion, he just testified not two minutes ago, that it
17 would not be possible in many important areas to reach
18 a conclusion that would support such a decision.

19 What more can he say?

20 MR. HEINTZMAN: Q. Can you not answer
21 that question, Mr. Penn or Mr. Daly?

22 MR. B. CAMPBELL: Just a minute.

23 THE CHAIRMAN: I have just forgotten what
24 the question is.

25 Is the question, was there an analysis

1 similar to the fossil fuel, was there one done? Well,
2 the answer to that is either yes or no, I take it.

3 MR. HEINTZMAN: To the knowledge of these
4 people, yes.

5 THE CHAIRMAN: Yes. You can answer that
6 question.

7 MR. PENN: I was personally involved in
8 the preliminary discussions on that matter, but we
9 unanimously came to the conclusion that I just stated
10 that we were not in a position to make a definitive
11 change in the life of nuclear plant at this time, and
12 we did, in this informal meeting, discuss the nature of
13 the Pickering design and the nature of the Bruce design
14 in coming to that conclusion. And that the sort of
15 studies that have Dr. Chada and Mr. Daly have been
16 commenting on are necessary in order to gain the
17 information to be able to make a responsible and
18 dependable decision.

19 MR. HEINTZMAN: Q. Well, you weren't
20 here, Mr. Penn and Mr. Daly, but when we were
21 discussing fossil stations nobody suggested that a
22 definitive - to use your word - change in life of the
23 fossil stations had been made.

24 We were told that, well, it may be
25 possible and it is something we hope will occur and we

1 don't know how long it will last and on and on and on.
2 So I don't want definitive changes in life extension.

3 What you are telling me though is that
4 (A) somebody has looked at the issue of extending
5 nuclear stations, that is what I understand you to be
6 saying, Mr. Penn?

7 MR. PENN: A. I stated that in formal
8 meetings that I have been present we have discussed
9 this issue. It's a subject that is reasonable to
10 discuss.

11 Q. That's why I am discussing it with
12 you.

13 And it is reasonable to believe based
14 upon present information that nuclear stations can be
15 life extended.

16 MR. B. CAMPBELL: Well, just a minute.
17 Again, Mr. Chairman, I think it is not fair to simply
18 go back and ask the same question over and over and
19 over again.

20 Mr. Penn has indicated clearly that in
21 his professional judgment there is not currently enough
22 information to reach that kind of conclusion. I think
23 it's unfair to just keep repeating the same old
24 question to him over and over and over again in the
25 hopes that in the late hour of the day you will get a

1 different answer.

2 Mr. Penn has answered the question quite
3 specifically.

4 THE CHAIRMAN: What he has said is, as I
5 understand it, is that he isn't in a position today to
6 say whether or not you can extend the nuclear plants
7 beyond their present designated life, and that he
8 wouldn't expect to be able to do that until sometime
9 about 10 years before the end of that period. Now
10 that's what I took his evidence to be. And that they
11 haven't done an analysis or been asked to do an
12 analysis similar to the one that was presented in Panel
13 8 about the extensions of fossil.

14 I am not quite sure what the next
15 question is.

16 MR. HEINTZMAN: Q. Well, maybe I can
17 come back to that, Mr. Penn. You have told us that you
18 can't make a decision in your view on the definitive
19 change on the life extension of nuclear stations for
20 some number of years. Am I understanding you
21 correctly?

22 MR. PENN: A. That's correct.

23 Q. I appreciate that, and in this
24 hearing we haven't been blessed with a definitive
25 analysis of fossil either. Now that's not your concern

1 or your problem.

2 But what I wanted to know was whether or
3 do I understand you to be of the belief that nuclear
4 stations based upon present information are extendible
5 in terms of their life and that that is a perfectly
6 feasible proposition?

7 THE CHAIRMAN: Well, I think you are
8 asking him to say something he said he can't say for 10
9 years.

10 Certainly he is not ruling out the
11 possibility that they can be extended.

12 MR. HEINTZMAN: I think you are asking
13 the questions far better than I am, Mr. Chairman, that
14 is the question I want answered.

15 MR. PENN: It is my hope and likely
16 expectation that it will be possible, but we do not
17 have at the present moment sufficient information to be
18 able to make that decision.

19 MR. HEINTZMAN: Thank you.

20 Q. And insofar as the information you
21 have given to us about the applications to extend the
22 lives of U.S. nuclear stations, is there any reason
23 that you would expect that those stations to be
24 extendible and the CANDU stations that Ontario Hydro
25 has to be any less extendible?

1 MR. PENN: A. There is no reason.

2 Q. Okay. I want to turn then to another
3 subject and that is the idea of or the concept of load
4 following or manoeuvring I think you referred to it
5 previously. And I guess my questions again -- I'm
6 sorry to not be spending more time with you, Dr.
7 Whillans and Mr. Johansen, but I am sure Mr. Hamer
8 will, and Mr. King.

9 We have discussed the idea of load
10 following and that is the use of a nuclear generating
11 station or indeed other stations at less than, let's
12 say, 80 per cent capacity to follow the load down or to
13 manoeuvre with the station at less than full capacity;
14 is that correct, Mr. Daly?

15 [4:26 p.m.]

16 MR. DALY: A. Yes, we have briefly
17 discussed that, yes.

18 Q. And I think I have handed to you last
19 week a document entitled Load Following in CANDU PHWR,
20 by H. Keil and A. Lopez, and I would ask Ms. Findlay to
21 hand that document out, and I would ask that it be
22 marked as an exhibit.

23 THE CHAIRMAN: Thank you.

24 THE REGISTRAR: That will be Exhibit No.

25 543.

1 ---EXHIBIT NO. 543: Document entitled Load Following
2 in CANDU PHWR, by H. Keil and A. Lopez.

3 MR. HEINTZMAN: Q. And does Mr. Lopez
4 work in your department, Mr. Daly, or where does he
5 work?

6 MR. DALY: A. He works in the same
7 division as I do.

8 Q. And this is a subject that you are
9 familiar with?

10 A. Yes.

11 Q. And reading from the abstract, the
12 second sentence says:

13 Various forms of load following
14 operations have been carried out at
15 virtually all CANDU stations in recent
16 years. The majority of these operations
17 have occurred at Ontario Hydro's Bruce
18 and Pickering stations. Results to date
19 have shown no adverse effects. Fuel
20 defects remain at less than .1 per cent,
21 the design target established for base
22 load operation. There have been no
23 equipment failures attributed to load
24 following to date. The general impact on
25 operation practices has also been

1 minimal.

2 In summary, the basic design features
3 of CANDU PHWR along with the high level
4 of reactor control automation allows easy
5 and safe load following operation to be
6 carried out.

7 That's a fair statement, is it?

8 A. That's a fair statement.

9 Q. And what does the author mean by,
10 "fuel defects remain at less than .1 per cent"?

11 A. Well, one of the potential concerns
12 with manoeuvring nuclear load would be: Would there be
13 any stress or strain on the fuel and lead to an
14 increase in the number of fuel defects? And this was
15 monitored and shown not to be the case, that
16 manoeuvring done did not have any adverse effect on the
17 fuel.

18 THE CHAIRMAN: I am not sure I know what
19 you mean by "fuel defect".

20 MR. DALY: Well, a small hole in the
21 sheathing material of the fuel bundle I showed you in
22 my direct evidence, which allows the fission products
23 to come out into the primary circuit.

24 MR. HEINTZMAN: Q. And why does reducing
25 or increasing the load on the generating station impact

1 on the potential for defects? Is there a cause and
2 effect there?

3 MR. PENN: A. Maybe I can answer that
4 question.

5 The process, Mr. Chairman, of fuel
6 failure in CANDU fuel, or light water reactor fuel for
7 that matter, is a process called 'stress corrosion
8 cracking'.

9 It is induced by applied stress caused by
10 power ramping during the fuel management process and
11 certain corrodants, which are the fission products that
12 are released within the fuel during fission; namely,
13 iodines and caesiums and silver.

14 So the answer to the question about load
15 following is that load following, changing power, and
16 step changes, causes a degree of stress, but experience
17 has shown that the nature of the load following we have
18 done causes insufficient stress to create stress
19 corrosion cracking.

20 And furthermore, we now have what we call
21 CanLube fuel which we have had for many years, which is
22 a film of graphite between the uranium pellets and the
23 outer sheath that acts as a lubricant to reduce the
24 stress.

25 So there is likely two reasons. I hope

1 that is helpful.

2 Q. The discussion starts off in the
3 introduction by saying:

4 Nuclear reactors have in the past
5 generally been operated in a continuous
6 high power (base load) operation to take
7 advantage of low nuclear fuel costs.

8 In Canada, as in other countries, the
9 nuclear component of a utility's energy
10 supply has increased. Thus, there is a
11 movement away from the role of base load
12 generation to one of flexible operation.

13 And that is what we are talking about in terms of
14 manoeuvring or load following?

15 MR. DALY: A. That is correct.

16 Q. And it says in the next paragraph:

17 The flexibility to operate in a load
18 following mode was anticipated during the
19 early design stages of the currently
20 operating CANDU stations. The provision
21 of automatic reactor control capability
22 permits easy changing of the power level
23 on demand. Qualification of main heat
24 transport components to allow for daily
25 load changes ensure minimum effect during

1 station operating life.

2 And that is a correct statement?

3 A. Yes.

4 Q. And then if we could -- I think we
5 can take much of this as taken as read.

6 If we could go down to the bottom of the
7 second page dealing then with -- perhaps on the first
8 page, just to deal with the first page, down on the
9 bottom right-hand corner, it says:

10 Ontario Hydro has planned and
11 initiated a major load following program.
12 In addition to actually operating in this
13 mode, an investigation both analytic and
14 monitoring program is under way.

15 And that was back -- I believe this was 1988 or so.
16 That program is still under way, is it, or what is the
17 status of that?

18 A. My recollection is that program is --
19 the task force that was set up has largely completed
20 its work, and this has become largely a matter of
21 routine operation at the present time.

22 Q. And at the bottom of the second page
23 under the heading CANDU 600: Operating Experience, it
24 refers to the four stations, CANDU stations, in Quebec
25 and in New Brunswick, Argentina, Korea, and it says

1 that: All these four stations have performed load
2 operations to some degree, et cetera. So load
3 following has been practised on CANDU 6s as well?

4 A. I understand that to be the case,
5 yes.

6 Q. And then going down to the bottom
7 right-hand corner of the third page just before the
8 heading "Operating Experience", the authors say:

9 The need to load follow with nuclear
10 reactors to meet system requirements had
11 been identified as early as the 1970s and
12 the early 1980s. Based on best
13 prediction of a reference load cycle,
14 Ontario Hydro reviewed the impact that
15 load following might have on the
16 operation of its nuclear plants. It
17 concluded that there would not be any
18 significant impact on its equipment nor
19 in its operating practices and
20 procedures. As a result, load following
21 operation was initiated, starting in
22 1986.

23 And that is correct, is it?

24 A. That is when we started doing it in a
25 significant way. We had done some small amount of it

1 prior to '86.

2 Q. And the presentation completes on the
3 third last page under "Conclusions", stating that:

4 Load following is shown to be
5 successful. Impact on operating
6 procedures, fuel, performance and
7 equipment has been minimal. Load
8 following operations at various CANDU
9 sites are planned to continue.

10 And I take it that is the case?

11 A. That is the case. And in particular,
12 our newer plants, particularly Bruce "B", with
13 improvements in design and so on, has proved to be
14 extremely good at manoeuvring.

15 Q. And then I have also given to you,
16 and if the Board could be handed, remarks of Mr. Lopez
17 and others from Ontario Hydro to the Canadian Nuclear
18 Society, ninth annual conference in 1988, June 13th to
19 15th, 1988, Winnipeg, Manitoba, if that might be marked
20 as the next exhibit?

21 THE CHAIRMAN: 544?

22 THE REGISTRAR: 544, yes.

23 ---EXHIBIT NO. 544: Remarks of Mr. Lopez and others
24 from Ontario Hydro to the Canadian
25 Nuclear Society, ninth annual conference
in 1988, June 13th to 15th, 1988,
Winnipeg, Manitoba.

1 MR. HEINTZMAN: Q. The point of this
2 article or presentation I would like to focus on is the
3 economic impacts of load following rather than the
4 operating, which this article deals with as well.

5 And if we turn to the third paragraph
6 under the abstract we learn that:

7 The results of our analysis indicate
8 significant savings on fuel replacement
9 costs due to nuclear manoeuvring
10 capability. This is achieved by
11 eliminating the need for shutting down
12 base load nuclear units and then having
13 to replace the required demand load from
14 manoeuvrable but expensive coal-fired
15 stations.

16 Between 1986 and 1987 Pickering "B"
17 and Bruce "B" demonstrated the nuclear
18 manoeuvrable capability of CANDU reactors
19 and saved Ontario Hydro \$1 million in
20 fuel costs. A typical load cycle at
21 Bruce "B" consisted of reducing power to
22 50 per cent...FP.

23 What's FP?

24 MR. PENN: A. Full power.

25 MR. DALY: A. Full power.

1 Q. ...holding at that power, then
2 returning to full power when station
3 required it. Deeper nuclear manoeuvres
4 where power is reduced to 20 to 25 per
5 cent FP have also been successfully
6 demonstrated.

7 That is a correct statement, is it?

8 A. That is a correct statement, yes.

9 Q. And at the top of the next line or
10 the next side of the page on the right-hand side at the
11 top, it says:

12 Because of the increasing fraction of
13 total electricity energy supply Ontario
14 Hydro's nuclear units can no longer be
15 regarded strictly as base load
16 generation. From 1988 through the 1990s
17 the nuclear plus hydraulic base load
18 generating capability will frequently
19 exceed the total system electrical
20 demand. As a result, nuclear units will
21 increasingly be required to manoeuvre or
22 shut down in order to help reduce the
23 amount of unutilized base load generation
24 during times of low demand.

25 And again, I think we could take this

1 much as read, and we have got lots of graphs that show
2 you how you manoeuvre, but if we go over to figure 5 on
3 the third page of the article, under that there is a
4 heading, "Economics". And it says:

5 The economic benefits from nuclear
6 manoeuvring arise from the differences in
7 incremental costs between nuclear energy
8 and hydraulic energy. The main economic
9 benefit from nuclear manoeuvring is
10 avoided hydraulic spill. The cumulative
11 savings associated with nuclear
12 manoeuvring is forecast to range between
13 \$63 million and \$170 million in 1988
14 dollars from the present to the end of
15 the century.

16 And is that a fair statement?

17 A. Yes, that was a fair statement at the
18 time this report was written. The load situation has
19 changed appreciably since then. There would certainly
20 be some differences.

21 I don't have an updated figure. We still
22 expect to do a significant amount of manoeuvring during
23 the '90s, but the figure is probably somewhat different
24 from the value in here.

25 Q. And the conclusion on the last page,

1 number 24, is that the -- reading from the second
2 sentence:

3 Experience between '86 and '87 prove
4 that these nuclear units can be
5 manoeuvred to meet system demand without
6 significant operating problems,
7 and basically the same operating conclusions as we read
8 in the previous article?

9 A. Yes.

10 Q. And I would like to look at an
11 article, which I believe that you have published in
12 something called CIGRE, which is an international
13 conference on large, high-voltage electric systems in
14 1987, "Cycling of Nuclear Power Plants to Meet Grid
15 Operational Requirements".

16 Are you familiar with this, Mr. Daly?

17 A. Yes, I am.

18 Q. And one of the --

19 THE CHAIRMAN: It should be marked?

20 MR. HEINTZMAN: Yes. Thank you very
21 much, Mr. Chairman.

22 THE REGISTRAR: 545.

23 ---EXHIBIT NO. 545: Article, published CIGRE, in 1987,
24 "Cycling of Nuclear Power Plants to Meet
Grid Operational Requirements".

25 MR. HEINTZMAN: Q. We can see from the

1 second page that this task force that analyzed nuclear
2 plant cycling was task force 02, of which one member
3 was a Mr. Carvalho.

4 MR. DALY: A. Carvalho, yes.

5 Q. And he is from Ontario Hydro?

6 A. Yes.

7 Q. So this is a sort of a more global
8 analysis of the same issue that we have discussed in
9 the context of Ontario Hydro's manoeuvring?

10 A. That's correct.

11 Q. And if we could look at the summary
12 on Roman numeral 2, the third paragraph after speaking
13 of the questionnaire which had apparently been
14 developed and circulated in various countries, says
15 that:

16 Seventy-one water reactor base nuclear
17 power plants participated in cycling duty
18 in 1985.

19 Is that the same as manoeuvring or load following,
20 those words?

21 A. Sorry, can you give me a page number?

22 Q. Little Roman (ii), in a bracket. It
23 should be the third page.

24 A. Sorry, I am with you.

25 Q. It says in the third paragraph:

1 Seventy-one water reactor base nuclear
2 power plants participated in cycling duty
3 in 1985.

4 "Cycling", I take it, is another word for the same
5 thing?

6 A. Yes.

7 Q. The trend for the future shows an
8 increase in the coming years with 128
9 plants expected to cycle by 1990. The
10 incidence of cycling for these countries
11 is expected to continue for the remainder
12 of the decade with significant increases
13 in the case of France where 52 units are
14 expected to participate in 1990, compared
15 with 129 in 1985.

16
17 And I think we have heard before that the
18 French load follow more than other countries; is that
19 correct?

20 A. That's correct, yes.

21 Q. With their nuclear stations.

22 I'm not sure that... We can see each
23 country's experience if we wish to, but on page 14 the
24 experience of Canada, and referring in particular to
25 the stations at Bruce and Pickering in the Ontario

1 Hydro network, is set out in the last or fourth
2 paragraph under "Canada", it states that:

3 The requirements for generation,
4 cycling of nuclear power plants, is
5 likely to continue in Ontario Hydro to
6 meet the needs of the network and its
7 demand profile.

8 That was the information at that time; is that correct?

9 A. That is, yes.

10 [4:45 p.m.]

11 Q. On page 21, among the conclusions,
12 6.1 says cycling capabilities of NPPs, the survey shows
13 that NPPs, nuclear power plants, are capable of
14 generation cycling to meet the operational requirements
15 set by economic load dispatching. The incidents of
16 cycling of NPPs to meet these needs was confined almost
17 wholly to water reactor-based NPPs.

18 Now, with that background, I would like
19 to look, if we could, at Interrogatory 9.2.45, tab 2.

20 THE REGISTRAR: 520.36.

21 ---EXHIBIT NO. 520.36: Interrogatory No. 9.2.45.

22 MR. HEINTZMAN: Q. And this
23 interrogatory sets forth the TUEC, or total unit energy
24 costs, for existing fossil and nuclear stations for
25 1989 up to 2008.

1 Do you see that?

2 MR. DALY: A. Yes.

3 Q. And if you would turn that second
4 page sideways with me for a moment and compare the cost
5 of operating Pickering "A", for instance, at a 40 per
6 cent factor, compared with the cost of operating one of
7 the fossil plants. If we look down Pickering "A" on 80
8 per cent factor it's 37 mills per kilowatthour at 80
9 per cent factor in 2003, for instance, if we can just
10 use that column for the moment, and 55 mills per
11 kilowatthour at 40 per cent capacity.

12 A. Correct.

13 Q. And if we load followed with
14 Pickering down to as little as 40 per cent, it would
15 still be cheaper than operating Lakeview, if we go over
16 with our eyes to the left-hand column at 40 per cent
17 capacity, where we see 67 mills per kilowatthour.

18 Do you see that?

19 A. I see that, yes.

20 Q. And the reason for that is because
21 the numbers under Pickering starting in 1989, 38 for 40
22 per cent and 25 for 80 per cent mills per kilowatthour,
23 while they're somewhat higher in the case of 40 per
24 cent than Lakeview, at 32 for 40 per cent, rise slower
25 in the nuclear station than they do in the fossil

1 situation, so that at the year that I am selecting,
2 2003, the Pickering plant at 40 per cent capacity is
3 cheaper to operate than Lakeview at 40 per cent; right?

4 A. That's what these TUEC comparisons
5 show and I guess that's also charted on the figures
6 that follow.

7 Q. Yes. And we are going to come to
8 those figures in a moment.

9 We could pick off the data if we wanted
10 to, it's about 1993 for comparing Pickering "A" to
11 Lakeview, that it's cheaper to load follow with
12 Pickering down to 40 per cent than it is to use
13 Lakeview, and the numbers stay lower even at 40 per
14 cent for Pickering thereafter, at 40 per cent for
15 Lakeview?

16 A. I believe these figures were done on
17 the basis of a constant 40 per cent or an average 40
18 per cent. You are talking load following which is an
19 implication of sort of moving up and down. So we are
20 really talking of staying at this lower level
21 essentially.

22 Q. Yes.

23 A. With that understanding, I agree.

24 Q. Yes. And what we are seeing here is
25 a correct scenario; namely, that nuclear stations

1 because of your initial capital cost, your low fuel
2 requirements, are going to become more and more
3 competitive in terms of cost, vis-a-vis the fossil
4 plants as we get out past the 1990s; is that fair?

5 MR. PENN: A. Well, that's certainly
6 what the figures show in these tables, but I would note
7 that on the front page of the interrogatory it says
8 that these forecasts are obtained from the following
9 attached reports, and I note that one is dated 1986 and
10 the other is dated May of 1988. And I do have some
11 concern that the price of coal, for example, that's
12 assumed in here is still relevant. I am just pointing
13 this out because I don't know, but I don't think that
14 we should necessarily read into evidence information
15 that is produced some years ago that may not now be
16 quite right.

17 Q. Well, this is the only piece of
18 information I can find in the whole hearing that
19 addresses this issue. If you are aware of more
20 relevant statistics, I would certainly like to see
21 them. But on the basis of these statistics, it appears
22 that it is more cost-effective to operate nuclear
23 stations in a load following mechanism or mode down to
24 40 per cent even and shut down fossil. That's what
25 these figures tell us.

1 A. And the main reason is the one you
2 gave, and that is the price of fuel is 20 per cent,
3 nuclear is 20 per cent of fossil.

4 Q. Right.

5 A. That's the basic reason.

6 Q. Yes. And the coal numbers on that
7 document produced back in 1988 don't include any costs
8 for putting on scrubbers or the other environmental
9 equipment that would be necessary if these units were
10 to be upgraded or extended as we have heard it is
11 proposed in the future; do they?

12 A. I am afraid I don't know, to be
13 honest with you. I wouldn't be at all surprised if
14 they don't include it.

15 Q. Right.

16 A. But I really don't know.

17 Do you know?

18 MR. DALY: A. No, I don't know offhand.

19 Q. From our analysis of them, and since
20 they were prepared back in 1988, we couldn't find any
21 evidence that the numbers on the left-hand side have
22 any component in them that would upgrade them with the
23 various environmental devices that it has been
24 suggested would or might be placed on the fossil
25 plants. And to the extent that those are necessary,

1 then the numbers on the left-hand side are going to be
2 even less competitive with nuclear, the nuclear numbers
3 on the right than we see in this document; isn't that
4 correct?

5 MR. PENN: A. That's certainly what the
6 document shows. And I can only assume that this is the
7 latest information we have in answering this
8 interrogatory.

9 Q. And if you look at those numbers,
10 sir, there is just no way on an economic standpoint
11 that you can justify extending the life of fossil
12 plants on the left rather than using nuclear generation
13 on the right to load follow and replace that
14 generation; is there?

15 A. I think that is a planning matter
16 that I can't comment on.

17 Q. Well, based upon those numbers do you
18 have any comment to the contrary?

19 MR. B. CAMPBELL: Mr. Chairman, I think
20 there has been evidence on this matter in Panel 3 as to
21 the appropriate use to make of TUECs in planning, and I
22 think the evidence of that panel is quite clear as to
23 the inappropriateness of using TUECs in that manner.
24 But I won't try and repeat that evidence. I will just
25 draw it to my friend's attention that that is a matter

1 that has been dealt with.

2 MR. HEINTZMAN: I will certainly go back
3 and look at that, but that has to do with using TUECs
4 now as a lifetime cost factor, as I understand it, and
5 the appropriateness of using LUEC. But when you are
6 comparing future years, what it's going to cost you in
7 2003, there is no other way than using a TUEC; is
8 there, or is that a question I should ask the planner?

9 THE CHAIRMAN: Hold it. I beat Mr.
10 Campbell that time. I think that really is going into
11 planning.

12 The primary concern is, first of all, to
13 find out whether or not you can extend them or not.
14 That would be the first question you would have to ask
15 yourself, wouldn't you, if you were a planner.

16 MR. HEINTZMAN: The numbers on the
17 right-hand side are not extensions. They are just
18 using Pickering A" in its present situation without
19 life extension because it's going to be shut down in
20 2011, in 2003 build another nuclear station if need be
21 to replace it, but use this station to replace Lakeview
22 or Lambton, where the difference is more, or Nanticoke
23 where the difference is more. That's the point I am
24 addressing.

25 THE CHAIRMAN: That seems to be a Panel

1 10 question.

2 MR. HEINTZMAN: Q. Do you want to
3 comment on that, Mr. Penn?

4 MR. PENN: A. I was just going to say
5 it's a planning matter because we have plants like
6 Lakeview and Lambton on the system to - well, certainly
7 Lakeview and Thunder Bay - to meet peaks in the middle
8 of winter. We need them then. We wouldn't be using
9 those plants necessarily to supply load at this time of
10 year when the demand is much lower.

11 We would use whatever happens to be the
12 most economic generation available on the day that we
13 want it. So, this is clearly a planning matter, to
14 meet the whole variety of issues that you come across
15 during the year, all four seasons.

16 Q. I appreciate that, but it's still a
17 mystery to me where planning stops and the utility or
18 generation expertise comes in. But the numbers on the
19 right-hand side are the numbers that fall into your
20 expertise or bailiwick as somebody involved in nuclear;
21 are they not?

22 A. These total unit energy costs have
23 been provided by our operations division. I am
24 familiar with them. I don't know what else to comment
25 on.

1 MR. HEINTZMAN: It's five o'clock, Mr.

2 Chairman, perhaps that's a convenient time.

3 THE CHAIRMAN: How are you doing?

4 MR. HEINTZMAN: I am doing very well.

5 [Laughter]

6 THE CHAIRMAN: I was speaking in terms of
7 time.

8 MR. HEINTZMAN: I expect to be finished
9 tomorrow morning and Mr. Hamer will then take over from
10 me and hopefully finish up later in the day or first
11 thing next day.

12 THE CHAIRMAN: Thank you.

13 We are adjourned until tomorrow morning
14 at ten o'clock.

15 THE REGISTRAR: This hearing will adjourn
16 until ten o'clock tomorrow morning.

17 ---Whereupon the hearing was adjourned at 5:00 p.m., to
18 be resumed on Tuesday, March 31, 1992, at 10:00 a.m.

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